AUGUST, 1956

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

FEATURED, THIS ISSUE:

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Channeling Air..p. 78 · Numerical Machine Tool Control..p. 83
Complete Editorial Index . . . p. 60
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BENCO
COLLETS

At right is a collet from a 1" machine. Note the threads are twisted off. Think about the trouble this caused besides the loss of time and production.

This will not happen to the Benco Collet shown at left. It's correctly engineered and carefully made. Remember Benco Collets are guaranteed against breakage for one year.

will not break off at the threads

will not run out more than .001 per inch

or your money back

Tests prove that the unique design of Benco Collets and our specialized manufacturing processes prevent two most common causes of collet trouble. Benco Collets are guaranteed against breakage for one year.

Benco Collets have threads with a tensile strength in excess of 175,000 pounds per square inch. These collets are made of high carbon alloy tool steel, not carburized steel. Precise manufacturing controls insure a guaranteed accuracy of .001 run-out per inch of bar extension from the face of the collet.

Even with all their extra features and guarantee, Benco Collets cost you no more than just ordinary collets. You get maximum satisfaction...you save time, money and grief by using Benco Collets. Select them every time, you can't get better quality, performance or value.

* BENCO MAKES Master Pushers and Pads • Master Collets and Pads • Pushers and Feed Fingers • Conventional Collets • Ejector Collets • Collet Sleeves and Chuck Nuts for B. & S. Machines • Carbide Faced Stock Stops for B. & S. Machines.

BENCO COLLET MANUFACTURING CO.
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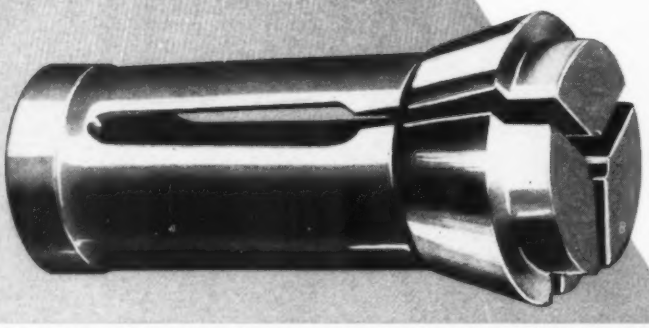
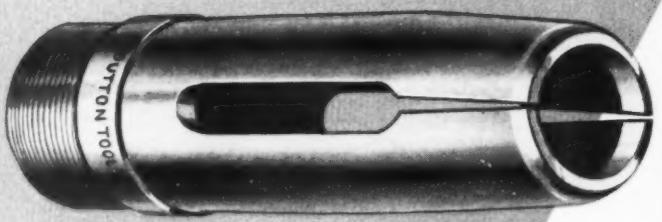
Get a better

and longer **GRIP** on production

with **SUTTON**





Collets and Feeders

Featuring uniform temper and tension

One of the reasons customers prefer Sutton Collets is the added useful life —a result of uniformity of temper and tension. Sutton's modern and *exclusive* method of heat-treating localizes controlled heat to give uniform spring temper on all collets and uniform tension on all feeders.

RUNS AS TRUE AS THE SPINDLE

SUTTON TOOL COMPANY

STURGIS, MICHIGAN

Here's an Idea

FOR YOUR SUGGESTION BOX . . .

Postiv-Lok tooling reduces costs as much as 25% or more by eliminating the integral taper shank from large end mills and putting it on a holder. The Postiv-Lok holder soon more than pays for itself through cost savings on end mills. The Postiv-Lok design also assures reduced set-up and change-over time on a machine when production requires switching from one end mill to another.

The versatility of application, found only in Postiv-Lok tooling, also saves much time, work and cost when changing a machine from one type of tool to another. For, a machine equipped with a Postiv-Lok holder is quickly and easily converted from milling to drilling, reaming or other operations. Postiv-Lok adaptors for various tools assure easy insertion and removal from holder with a minimum of machine down-time.

The standard line of Putnam Postiv-Lok end mills will in most instances provide a tool that exactly meets your cutting requirements. However, we will manufacture to your exact specifications special Postiv-Lok cutting tools.

Your local Putnam distributor will be happy to discuss tooling problems with you, make recommendations or quickly serve your needs with standard Putnam end mills . . . we suggest you contact him for quality service and use Postiv-Lok on the big jobs for best results.

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TOOL COMPANY
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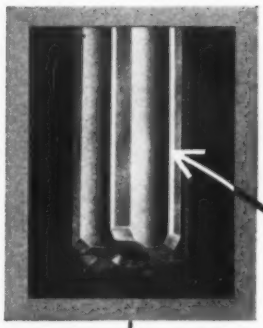

This edge cuts reaming costs

L+I gives you the edge on production

Call your L+I distributor

The Reamer Specialists

L&I

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TOOLING and PRODUCTION

The Magazine of Manufacturing Management

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VOL. XXII—No. 5
AUGUST, 1956

George J. Huebner, Founder

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Editorial ..... Page 63

TOOLING and PRODUCTION'S great appeal is to those men who operate the plants and divisions of industry, their production departments and their toolrooms. It is they who collectively are charged with the responsibility of manufacturing their companies' products precisely, efficiently and profitably.

They have the influence that enables them to adopt the ideas and the processes which TOOLING and PRODUCTION describes in every issue AND the authority to recommend, to specify and/or to buy everything that may be needed to reduce costs, increase production or improve quality. These men for whom, each month our editors seek out or write TOOLING and PRODUCTION'S meticulously accurate stories of "Know-How" and "Tell-How" are T & P's exclusive Cycle of Buying Influence (CBI) in their plants.

Every copy is directed to these men by name, by title and by company address. Please see our BPA verification.

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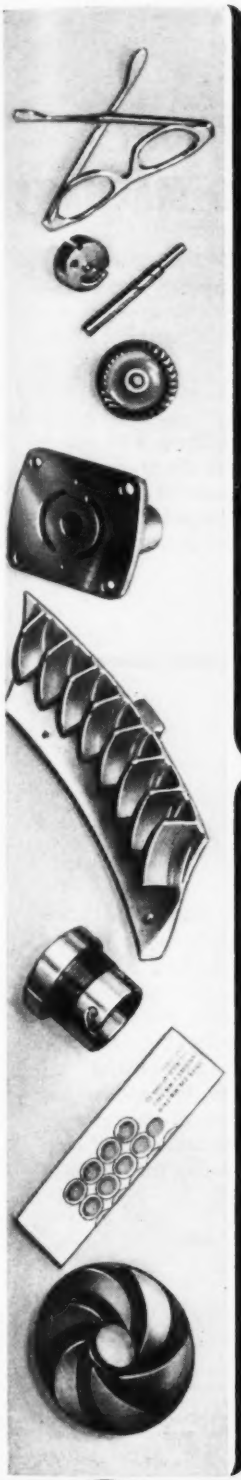

A few examples of work produced on Gorton Pantographs at substantial savings in time and money

240 PIECES PER HOUR
This fuse part, of No. 1213 steel, has a serpentine groove with irregular radii. Two pantograph cutters rough out and the other two finish parts in pairs. Groove is .1903" wide, plus .0014", by .109" deep, plus .003". Finish: 35 mcr.

GORTON Multiple Pantographing

Volume Production • Precision Tolerances

Tool room accuracy with production line speed is characteristic of Gorton Pantographs. These versatile machines will turn out a dozen . . . or a million . . . finished pieces from one setting with no perceptible variation in required tolerances. From two to six different operations can be performed at each setting with all operations completely automatic within the cutting cycle. In fact, output is limited only by the capacity of the cutter. Spindles turn at 900 to 45,000 RPM providing infinitely variable cutting speeds and feeds.

Shape of part matters little. Two or three-dimensional cutting can be performed on flat, cylindrical, spherical, square or irregularly shaped work. 16 Pantograph models cover a wide range of applications in profiling, grooving, slotting, milling, chamfering, graduating, counter boring, die sinking, mold making, routing, engraving, grinding, burnishing and etching. Models provide manual, semi-automatic and fully automatic cycling. Custom built.

Write for Bulletins 1655, 2595-DS, 2604-DS, 1208.

New P1-2 heavy-duty model with 3/8" spindle capacity and 1/3 HP motor available

GORTON
SINCE 1893

GEORGE GORTON MACHINE CO.

1208 RACINE ST., RACINE, WISCONSIN

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A 8846-1P

CIRCLE INFORM-A-GRAM KEY NO. 5

New Major Developments

from Henry & Wright and V & O Press

. . . for extending economics of progressive stamping

. . . for faster, safer feeding with geared presses

NEW HENRY & WRIGHT Double-Crank DIEING MACHINES

Here's a new H & W development designed to reduce the unit cost of metal stampings. Engineered to bear loads encountered in long progressive dies while maintaining precision registration of punch and die, H & W's Double-Crank assembly also offers you greater flexibility in ratio of die bed to press capacity. Thus you can: (1) form larger parts with lower capacity machines than before possible; and (2) handle stampings requiring high pressures with greater precision and longer die life than before. Special features of the new H & W Double-Crank machines include:

NEW V & O One-to-One FEED-O-MATIC

Now you can equip your geared pneumatic clutch presses with V & O Feed-O-Matics and gain all the advantages of precision automatic feeding — increased production, greater personnel safety, and precision quality control. The Feed-O-Matic for geared presses is driven directly from the drive shaft on a one-to-one ratio. Mechanical "fingers" of the Feed-O-Matic lift parts up, over and into the die for precise placement. High cost tools can be used with less fear of breakage and stop motions are eliminated. Write today for complete information.

PHONE, WRITE OR WIRE THE REPRESENTATIVE NEAREST YOU

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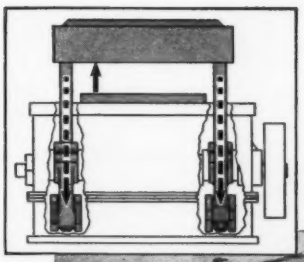
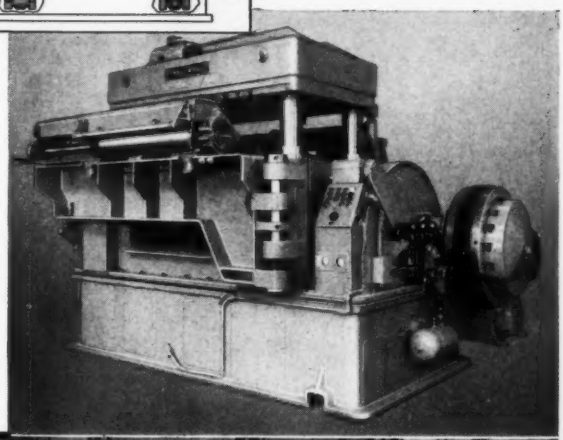
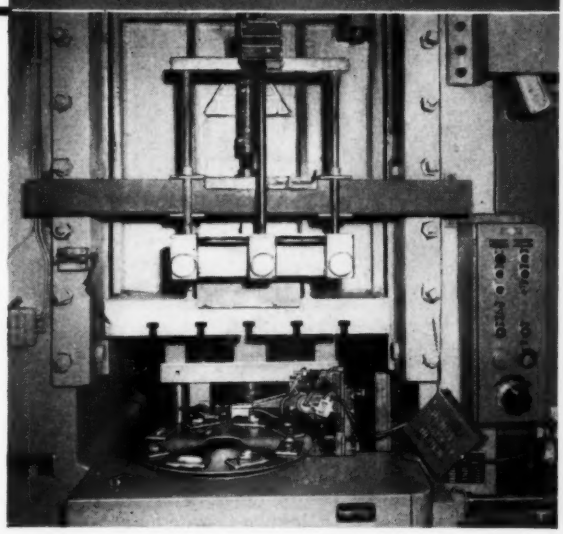


New 350-Ton Dieing Machine. Insert drawing shows advantages of new Double-Crank assembly.

(1) Completely enclosed to prevent chips, slugs, stock lubricating compound and other foreign matter from entering and damaging working parts; (2) A self contained recirculating lubrication system; (3) Large area chutes at front and rear for disposal of finished parts, scrap slugs and installation of stackers; (4) Swing-out type roll feed, solidly supported on knees when in operation; (5) Roll feed driving mechanism completely enclosed; and (6) Crosshead adjusting mechanism is conveniently located within the upper crosshead for easy accessibility. Write today for complete details.





The Feed-O-Matic® is simple and self contained, well enclosed, but highly accessible for servicing.

Behind each Henry & Wright - V & O representative are two engineering organizations geared to work out problems ranging from simple blanking to automated "packaged" presses. He will fit into your production planning team like the "pro" he is . . . adding his experience to yours in terms of your requirements.

Presses and methods that automatically reduce costs

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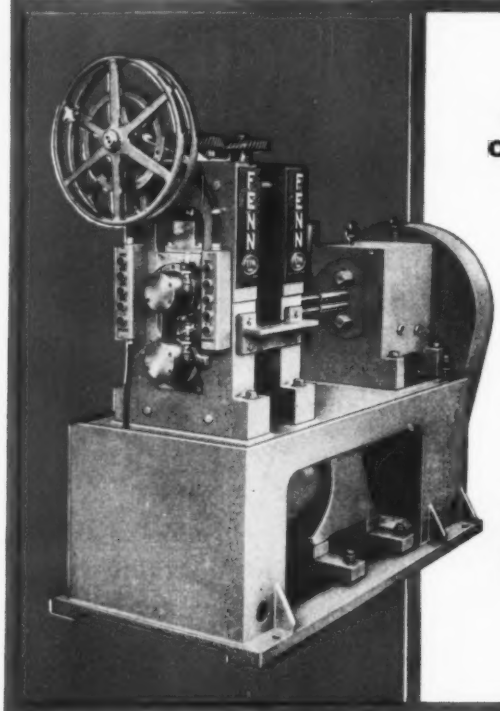
NEW LABORATORY SIZE
ROLLING MILL



COMBINES
PRECISION
VERSATILITY
COMPACTNESS
MODERATE COST

EXTRA HEAVY BEARINGS PERMIT ROLLING NEWEST AND TOUGHEST METALS

MODEL 4-053 is the newest and finest Precision Rolling Mill engineered especially for metallurgical and research laboratories in industry and colleges . . . or for a production mill in many applications. Extremely flexible it can be used as (1) a two-high, (2) a four-high with work rolls driven, and, (3) a four-high with back-up rolls driven. This unique three-way drive, and a full line of accessories, permit a complete range of reductions in both hot and cold rolling. Write for complete specifications or copy of our rolling mill catalog.

FENN

FENN ENGINEERING SERVICE is available at all times to help you solve rolling problems. Fenn engineers will also gladly test-roll samples of your materials.

Precision Rolling Mills

Turks Heads

Wire Shaping Mills

Swaging Machines

Wire and Tube Drawing Machines

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CIRCLE INFORM-A-GRAM KEY NO. 8

★ ★ ★ ★ ★ ★ ★ ★

Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★

BUYING TO KEEP COSTS DOWN

by H. Thomas Hallowell, Jr.
President
STANDARD PRESSED STEEL COMPANY
Jenkintown, Pa.
and President
AMERICAN STANDARDS ASSOCIATION

THERE NOW EXIST SO MANY more ways to do any given job than ever before that we tend to become confused about what is old and tried in contrast to the new and unproven. Of course the only right way to progress is to use the very best course available — a combination of the best of the old and the new ideas.

When things are changing so fast, it is quite easy to be diverted by the glamour and "hoopla" and advertisements of "pie in the sky" promised by the would-be creators of tomorrow's necessities.

Let's not discourage this dynamic atmosphere, but let's go to work to bring the pie in the sky down to earth so that we can enjoy it as pie on the table — profitably so all can benefit.

We know that we have had continuing long-term inflation which will probably continue on a controlled or semi-controlled basis. We should also know that using capital is a lot cheaper than using people's efforts. By using larger doses of capital in modern plants, with enlightened management and cooperative workers, we can bring about low costs by large-scale standardized production. In this way we can combat inflation.

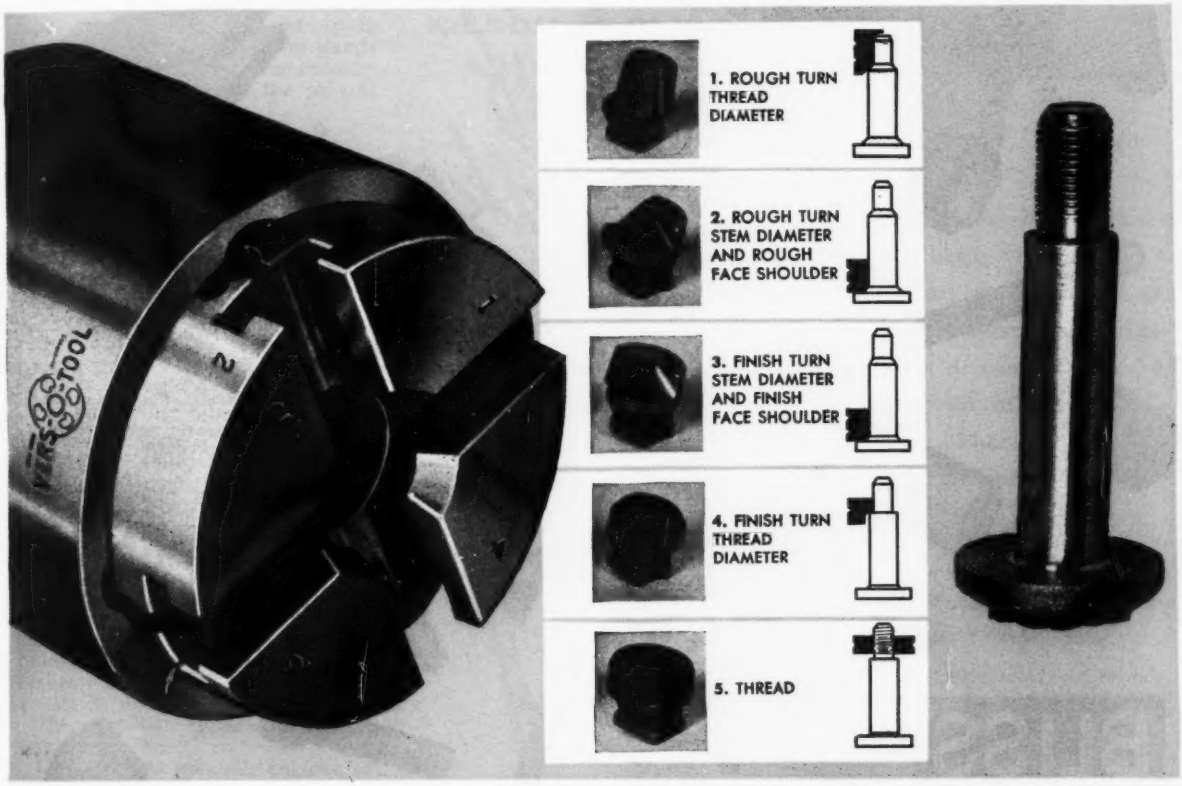
To bring about this large-scale production we need a product that will have as widespread a use as possible. In our own company on our standard products the over-all prices have gone up less than 30% since 1940, while wages have gone up over 135%, steel prices up about 85% and freight rates up approximately 45%.

Adapted from Mr. Hallowell's talk at the National Association of Purchasing Agents' Annual Meeting in Cleveland.

HERE'S HOW NAMCO VERS-O-TOOL

CUTS COSTS... SPEEDS PRODUCTION ON END TURNING AND FORMING

In this application 300 lever supports an hour are turned out on a vertical six-spindle automatic. Vers-O-Tool machines these steel forgings three times faster than single point tools, opens at the end of the cut, leaves no spiral marks on the work.


VERS-O-TOOL
1. ROUGH TURN THREAD DIAMETER
2. ROUGH TURN STEM DIAMETER AND ROUGH FACE SHOULDER
3. FINISH TURN STEM DIAMETER AND FINISH FACE SHOULDER
4. FINISH TURN THREAD DIAMETER
5. THREAD

Vers-O-Tool licks tough production problems because:

1 Basic Vers-O-Tool design permits cutters or ground thread chasers to be changed quickly without adjustment in the head.

2 All settings in the blocks are made in the tool-room with a micrometer gauge—no need for trial and error run after changing or grinding.

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the National Acme company

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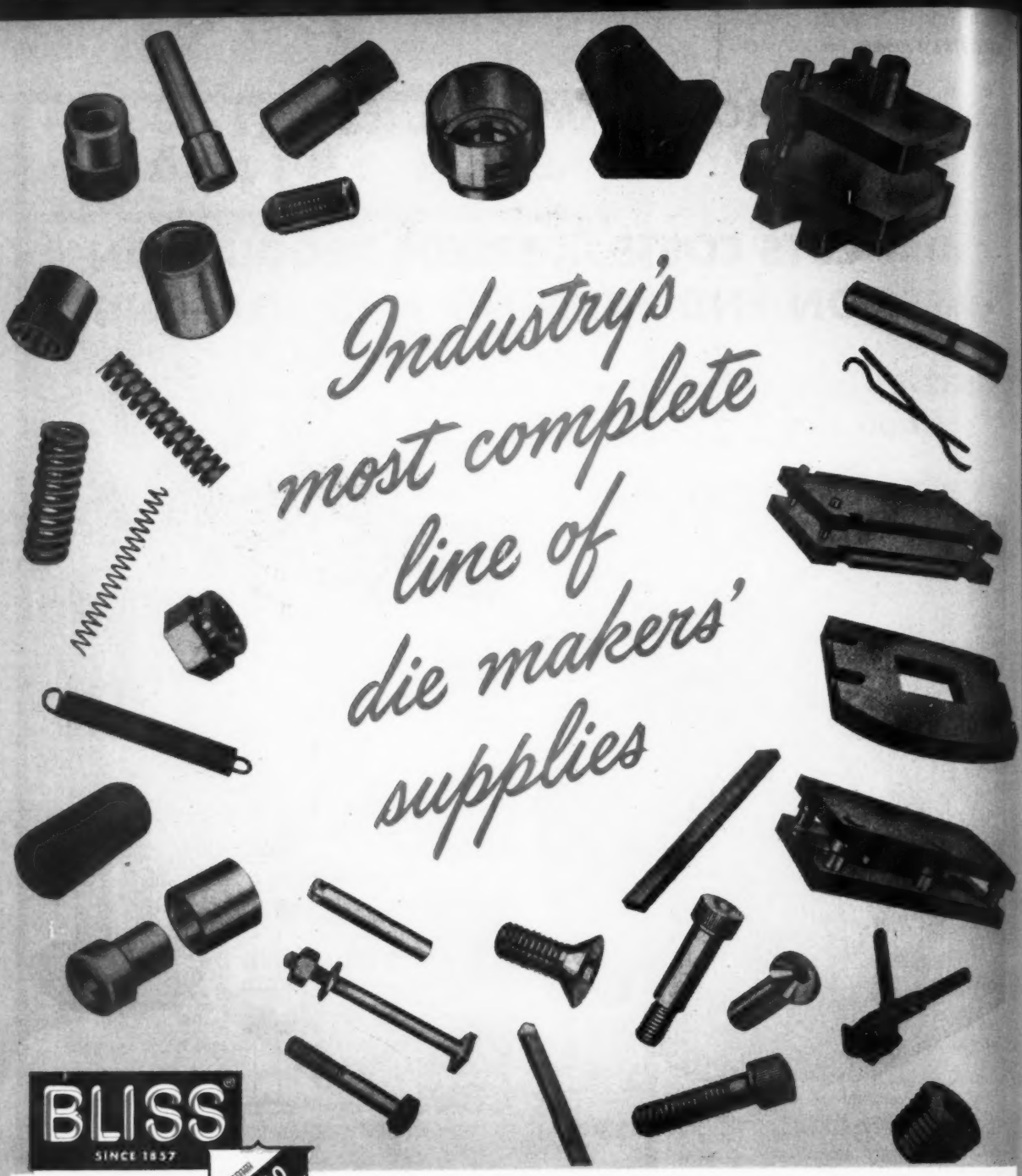

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However, today on non-standard items costs and prices are many times higher than 20 years ago.

Capital assets are not high production items and tend to be made by custom methods. The cost of capital assets, therefore, have probably gone up several times whereas production items have gone up only a few percentage points.

Small lots of special items are not produced economically by any supplier when compared costwise and pricewise with the closest standard substitute. Furthermore, an informed supplier prices his standard items at such a low price as not to bring undue competition into the field.

Even with a constant campaign on converting "special" users to "standards," we do a very large volume of special item business. A whole division of our company is set up to handle these variations from standards as promptly and economically as possible to minimize the pain of a necessary special.

A Case for Standards

These simple facts of industrial life today apply not only to your suppliers. You'll find even more graphic illustrations in your own operations. How long can a situation such as this continue? As long as your profits and your management will allow!

Management plans, organizes, directs and controls the use of capital and efforts in our American industrial setup, and management decisions require a dollar tag on them. To lower purchasing costs your purchasing executives, more than ever before, are the people who can put the price tag on the wastefulness of the non-standard requirements of special required by your company.

Specials need special treatment all along the line. They must be screened and estimated. They require special engineering, expediting, processing, etc. Fewer specials mean higher volume, longer runs, and continuity of operations.

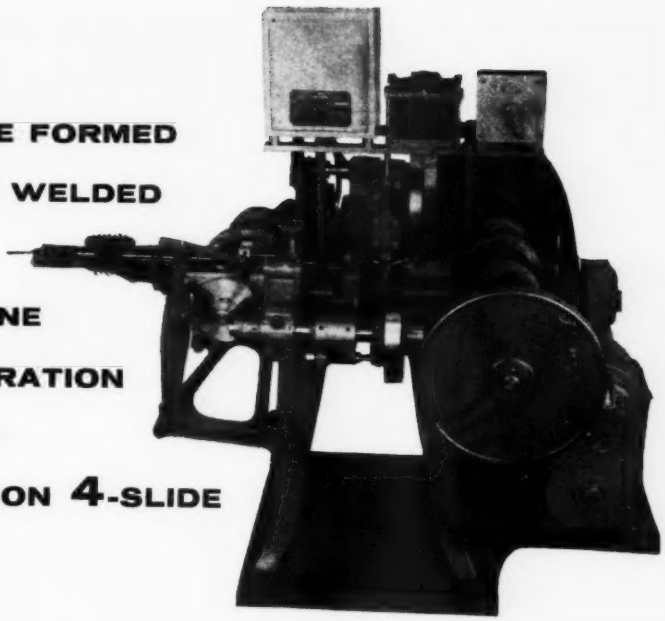
There are four types of variations from standards:

Class 1: A specially-engineered item which serves a very necessary useful purpose, is needed in large quantities, and when used improves the performance of the end assembly in such a way that its increased cost or nuisance value is more than offset by greatly improving the end performance of the products.

Class 2: A specialty item which perhaps could be eliminated or converted to a standard if sufficient time and thought were put on the problem, and whose extra cost can be economically justified by a slightly increased utility of the end product.

Class 3: A specially-designed item which does not serve any very useful purpose. Its extra cost is not made up in increased utility of the end product.

WIRE FORMED AND WELDED IN ONE OPERATION WITH NILSON 4-SLIDE



Garter loop formed and welded in one fast operation by Nilson 4-Slide.

Production is increased more than 25% by Hawie Manufacturing Company using a #1 Nilson 4-Slide with welding attachment which eliminates need for ferrule loops in the manufacture of hose supporters. .062 soft basic wire is formed with ends welded in one automatic operation at a conservative 105 pieces per minute. Additional savings are realized in eliminating cost of ferrule.

Another example — Drapery hook is formed with two wires entering 4-Slide simultaneously and automatically welded together at point of contact.

Nilson 4-Slides will produce many types of wire forms similar to the part shown here in which two pieces must be welded or otherwise closed together. By the mounting of automatic welding equipment on the 4-Slide, such parts can be produced in one fast, accurate operation at minimum cost. Nilson 4-Slide Wire Forming Machines are available in a wide range of sizes to handle basic steel wire from 1/32" to 1/2" diameter.

A.H. NILSON MACHINE COMPANY

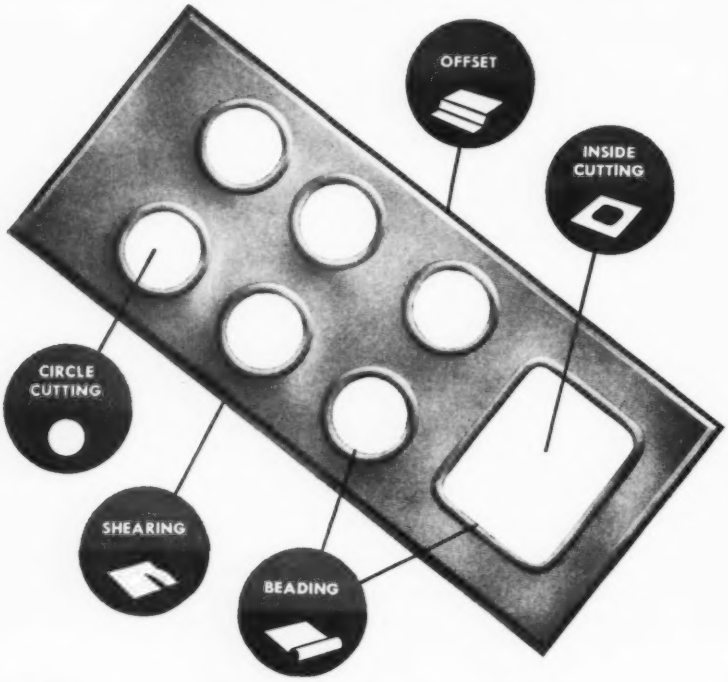
1522 RAILROAD AVENUE, BRIDGEPORT 5, CONN.

Automatic Chain Making Machines • Staple Forming Machines • Wire and Stock Reels • Wire Straightening Equipment • Slide Feeds for Presses • Wire and Ribbon Stock Forming Machines

CIRCLE INFORM-A-GRAM KEY NO. 11

PULLMAX METALWORKING IDEAS

Expensive dies eliminated with standard Pullmax Tools

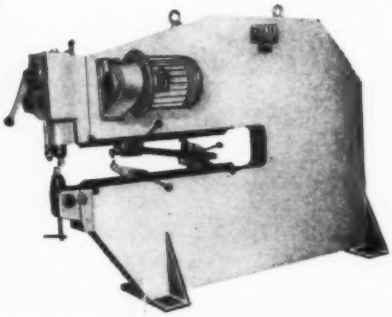


This steam table top was made completely on a PULLMAX

Only the Pullmax universal shearing and forming machine has the versatility to do all of the metalworking jobs in your Model Shop, Engineering or Maintenance Departments.

This one versatile machine does straight shearing, inside or outside circle cutting, design cutting, inside square cutting, beading, joggling, slot cutting, louver cutting, dishing, edge bending and flanging.

7 sizes of machines cut up to 1¼" in mild steel. Ask for a demonstration right in your plant.



AMERICAN PULLMAX CO., INC.
2469 N. Sheffield Ave., Chicago 14, Ill.

MORE MONEY-SAVING METALWORKING IDEAS ARE YOURS IN THIS ***FREE*** BOOKLET

Please send us the Pullmax Catalog on Money-Saving Metalworking Ideas.

NAME_____

STREET_____

CITY_____ ZONE_____ STATE_____

TITLE_____

CIRCLE INFORM-A-GRAM KEY NO. 12

Class 4: A special whose costs are completely out of keeping with the economics of the assembled product, the elimination of which can bring about savings many times greater than the cost of engineering man years if required to do so.

Buyers Help Whole Industry

Purchasing executives should have sufficient standing in an organization to allow them freedom to be uninhibited in presenting helpful suggestions to the engineering department. Probably more than half of the special items could be eliminated if someone were to ask, "Is this really necessary?"

Just why does anyone need a special length of thread on a cap screw? This is usually the result of some engineer's design. He should have looked at a cap screw standards book. Why is a very long hollow set screw necessary? It's a special. It costs a great deal more than a standard. Why not screw two short hollow sets in the hole, one on top of the other? This approach can bring about untold savings.

Standardization can proceed at a much more rapid rate if company atmosphere reflects top management thinking which makes possible an intelligent interchange of ideas between engineering, stores and purchasing, with the proper dollar tags attached so the most economic way is achieved before the final decision is made.

Purchasing is in a unique position because their job is to select their supplier. They can do business with progressive suppliers who have large research divisions in their organizations. They can be a constructive influence on the research programs of their suppliers. By bringing the supplier's research men in contact with their own engineering and development men, new products and components can be devised so that they will have the greatest chances of serving a useful need. Quite often a supplier-consumer relationship can develop a standard product which can have an industry-wide application.

Suppliers Test Performance

Today a supplier must furnish complete data as to specifications and performance and satisfactory proof of testing on his product. This eliminates the need for the user to do this checking in a field in which he is not a specialist.

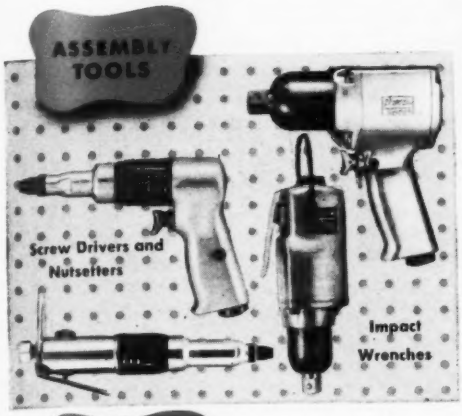
Titanium aircraft bolts which we currently produce in quantity are the outcome of a three year experimental program which cost us more than a half million dollars. They are 56% as heavy as their steel counterpart yet have the same tensile and shear values as heat-treated alloy steel, and the fatigue characteristics equal or better.

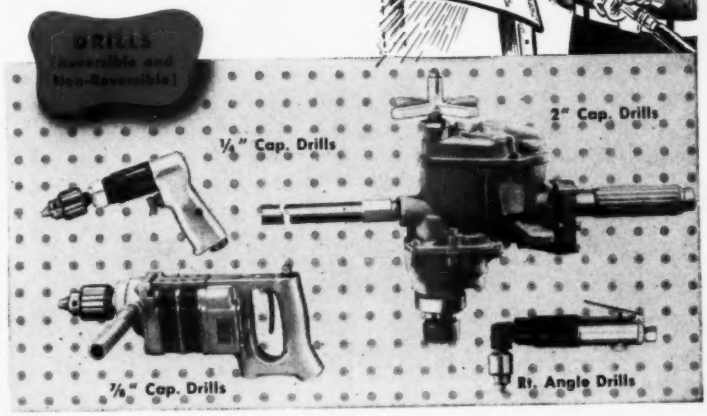
The control techniques on this item are so unusual that no customer

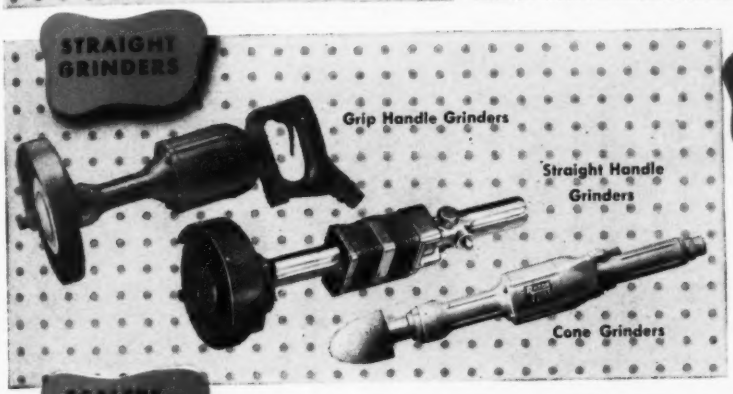
. . . *Continued on Page 18*

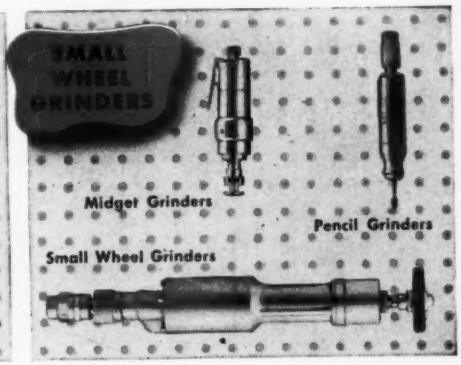
What's your portable tool problem?

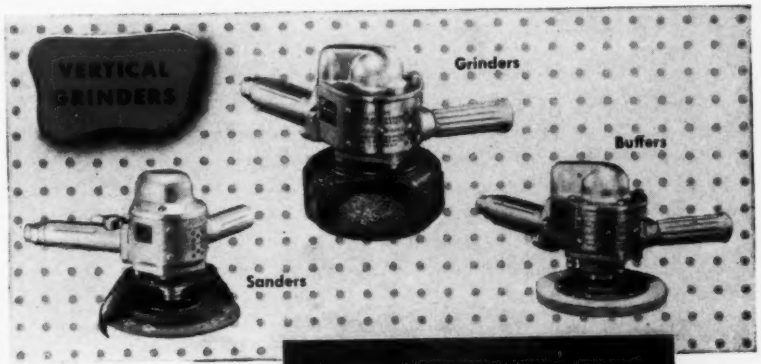
THERE'S A POWERFUL ROTOR TOOL TO DO IT FASTER!











● Write for Bulletin 53 giving specifications on complete line of Rotor Tools for all industry. The ROTOR TOOL Company, Cleveland 32, Ohio.

ROTOR TOOLS®
CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

CIRCLE INFORM-A-GRAM KEY NO. 13

Two of America's Most Modern

22 BLISS HYDRO-DYNAMIC PRESSES WORK FOR BOTH ARMY AND NAVY AT EKCO PRODUCTS

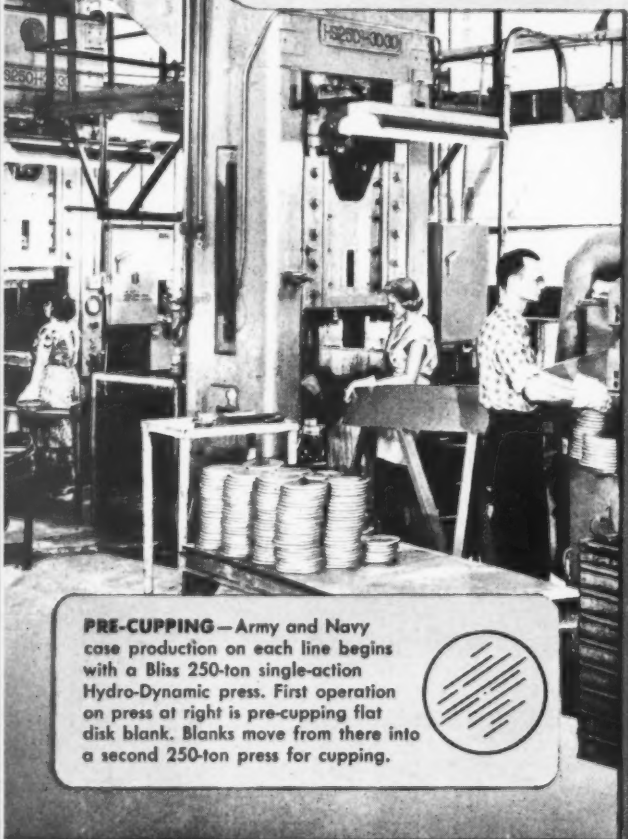
At Ekco Products Company, Chicago, one line of Bliss presses ranging from 75 to 2500 tons produces 76 mm cartridge cases... and another line of eleven makes 3"/50 Navy cases.

The speed at which the lines are operated is "classified" information, but you may be sure it is exceptionally fast. As a matter of fact, their performance so exceeded their original "specs" that the lines have become known throughout the ordnance world.

Press operations on both lines are the same—a series of eleven steps beginning with pre-cupping a steel blank, then cup, four draws, pre-head, final draw, heading, and two tapering operations. Only difference between the Army and the Navy lines is a slight variance in tapering techniques.

Designing and building entire ordnance lines, both hydraulic and mechanical, has been a specialty of Bliss since Spanish-American War days. Today, Bliss press lines are as common throughout ordnance as they are throughout industry at large.

If you have a pressed metal problem, put this experience to work—let Bliss help you pick the one right press—or press line—for the job.



PRE-CUPPING—Army and Navy case production on each line begins with a Bliss 250-ton single-action Hydro-Dynamic press. First operation on press at right is pre-cupping flat disk blank. Blanks move from there into a second 250-ton press for cupping.

DRAWING—Third draw is made on this Bliss 125-ton press. Long punch stretches case to almost its final length. (Two more draws complete the job.) Long strokes combined with fast approach and return speeds suit this press to production of steel cases.

BLISS SINCE 1857 ®

is more than a name... it's a guarantee

E. W. BLISS COMPANY, Canton, Ohio

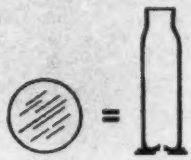
Presses, Rolling Mills, Rolls, Special Machinery

Steel Cartridge Case Lines

HYDRO BLISS DYNAMIC

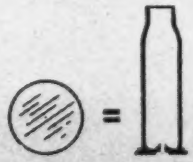
Eleven Press Operations On Each Line

ARMY



From this...to this

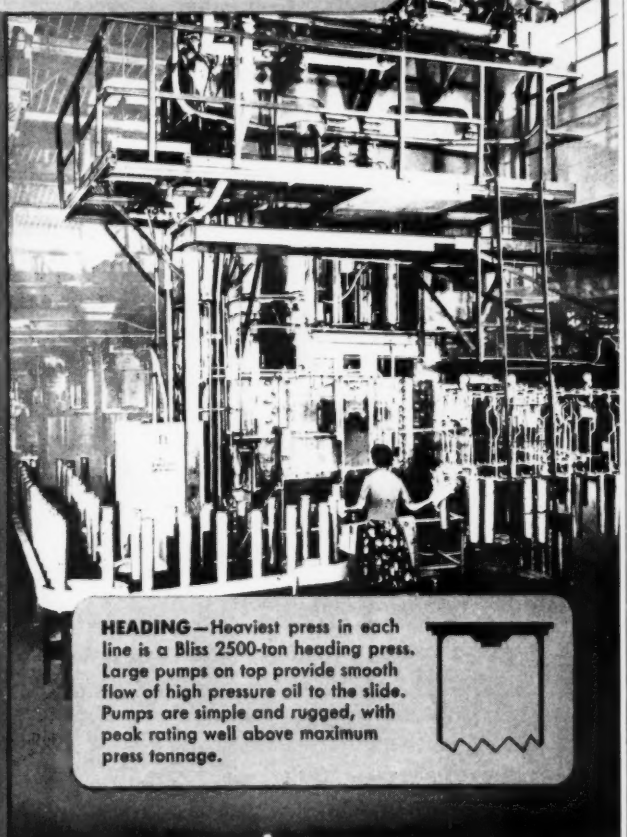
NAVY



From this...to this

OPERATION	PRESS	CAPACITY
1. Pre-Cup	Bliss HS250	250
2. Cup	Bliss HS250	250
3. First Draw	Bliss HS200	200
4. Second Draw	Bliss HS150	150
5. Third Draw	Bliss HS125	125
6. Fourth Draw	Bliss HS100	100
7. Pre-Head	Bliss HS1500	1500
8. Fifth Draw	Bliss HS75	75
9. Head	Bliss HS2500	2500
10. First Taper	Bliss HS75	75
11. Second Taper	Bliss HS75	75

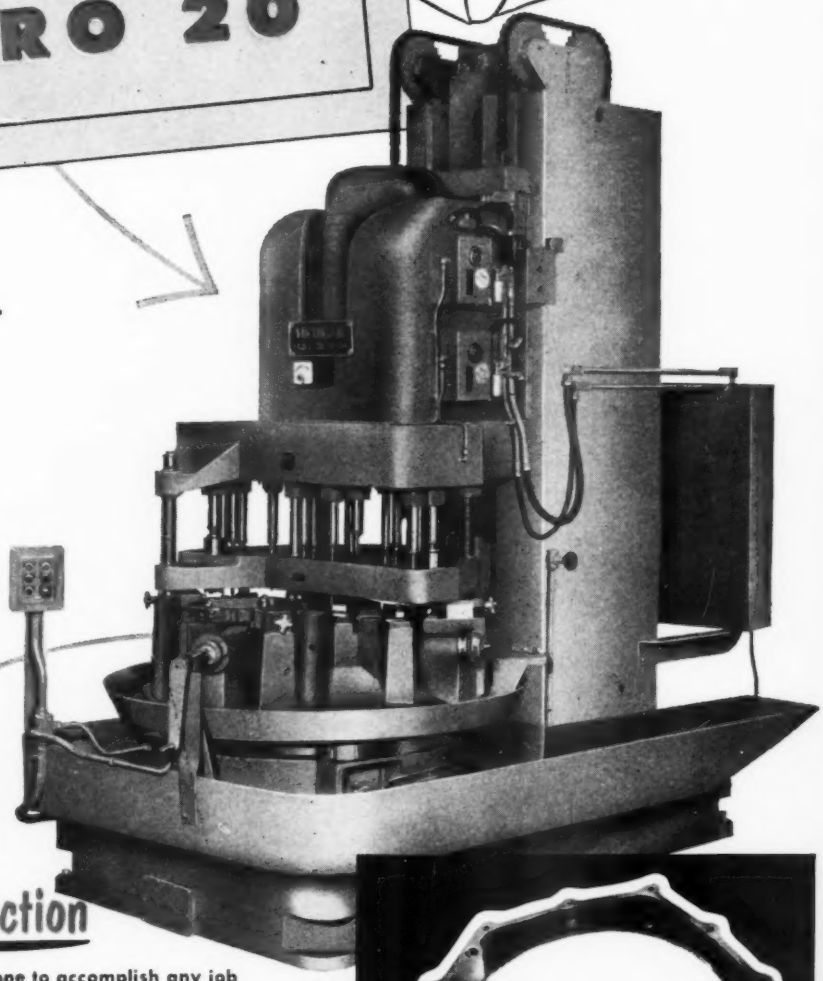
PRE-HEADING—This 1500-ton press, which pre-heads cases, is equipped with a Bliss-designed shuttle, allowing it to be loaded with one case while another is still in the press. Shuttle makes it easier to load and unload thus speeding production.



HEADING—Heaviest press in each line is a Bliss 2500-ton heading press. Large pumps on top provide smooth flow of high pressure oil to the slide. Pumps are simple and rugged, with peak rating well above maximum press tonnage.

U. S. Plants: Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; San Jose, California, Midland and Pittsburgh, Pa. Branch Offices: Boston, Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Pittsburgh, Philadelphia, Rochester, Salem, San Jose, Toledo, Washington, D. C. and Toronto, Canada; E. W. Bliss (England) Ltd., Derby; E. W. Bliss Co., (Paris), France. Other representatives throughout the world.

MICHIGAN HYDRO 20



Tooled Up To...

DRILL, REAM
CHAMFER
ROUGH BORE
FINISH BORE
100 FLY WHEEL HOUSINGS PER HOUR

For Faster, More Economical Production

- Rugged column forms firm backbone to accomplish any job
- High strength to power ratio
- Automatically lubricated throughout
- Drill head mist lubricated
- Indicator (mounted at the front) protects motor from overloads
- Fixture mounted on Michigan 4-station 42" hydraulic index table

We also invite your inquiries as to our line of tapping units, and index tables, both manual and automatic

Four other sizes available

Hydro—3 Hydro—10
Hydro—5 Hydro—30

Michigan **DRILL HEAD CO.** Detroit 34, Michigan

engineers and manufacturers of production machines and drilling equipment

CIRCLE INFORM-A-GRAM KEY NO. 16

WHATEVER you need in mechanical gages

Consult STANDARD First

IT'S a great advantage to work with a firm that presents a complete line . . . to deal with gage makers who understand your problems . . . to get the one gage *just right* for *your* job. Whether you work from our catalog or consult with us, you are assured the finest available instruments for your particular needs.

GAGES are our only product. To you, that means the benefit of over 30 years concentrated knowledge and experience. It also means wide selection, progressive design and time-and-money-saving innovations. For instance: Dializer® for converting ordinary snap gages to dial snap gages; DuBo® plug gage which tells more, more easily; Versa Dial® basic dial unit for a host of applications. These are some of the reasons *it pays* to *standardize* on STANDARD. Your inquiries are invited.

Send for Catalog

STANDARD GAGE COMPANY, INC.

MEASURING INSTRUMENTS FOR PRECISION INDUSTRY

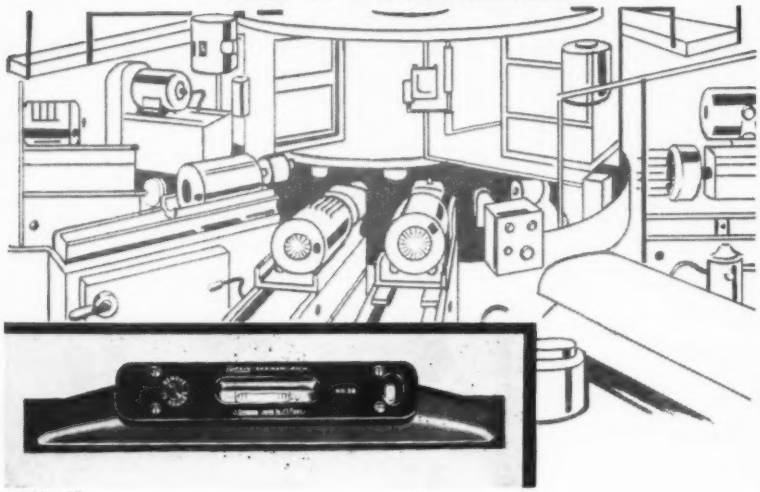
116 PARKER AVE. POUGHKEEPSIE, N. Y.

STANDARD Gages

CIRCLE INFORM-A-GRAM KEY NO. 17

LUFKIN LEVELS

provide the perfect alignment vital to AUTOMATION



No. 59

Automation machinery requires perfect alignment to operate smoothly and without undue wear. Stoppages for adjustments and repairs can be reduced to a minimum by using reliable Lufkin Levels for perfect initial alignment and maintenance.

LUFKIN MASTER PRECISION LEVELS

Lufkin Master Precision Level bases are hand scraped to exacting tolerances to provide true surfaces without excessive cohesion. They provide true horizontal settings to 10-second accuracy. Each division on the graduated glass vial equals .0005 inches per foot.

Special aged iron alloy base has less temperature change and an extremely rigid construction. Non-conductive top plate resists effect of body heat. Tamper-proof adjustment. Height 3", length 15" and width 1½".

LUFKIN MACHINISTS' LEVELS WITH V-GROOVE BASE

No. 57 PLAIN VIAL
No. 58 GRADUATED VIAL

"V-GROOVE" bases provide a broader bearing surface for more accurate seating on any size shaft. Choice of plain or ground glass graduated vials, 60-second accuracy with one declination line equal to .0035 inches per foot. Cross and plumb vials, with main vial protected by metal tube which turns to expose graduations. Levels furnished in 6", 8", 12" and 18" lengths.

BETTER MEASURE WITH LUFKIN

BUY LUFKIN

TAPES • RULES • PRECISION TOOLS

THE LUFKIN RULE COMPANY

Saginaw, Michigan New York City Barrie, Ontario

SAVE UNCERTAINTY

Consult your Industrial Distributor

- He has the answers to "Where can I get it?" at his fingertips — often from stock for immediate delivery.
- His experience gives him a sure answer to your question, "Is this the best solution to my particular problem?"

CIRCLE INFORM-A-GRAM KEY NO. 18

425

. . . Talk of Month, from Page 12

at this time has adequate facilities to check the finished item. Therefore, our organization has taken on the added responsibility of furnishing all information required by the customer and we certify that the facts are correct on each individual item shipped. This procedure is being used on an increasing number of our new items.

Standardization makes it possible for approximately 75% of our annual business volume of more than $50-million to be stocked by our distributors all over this country and in other parts of the world. A standard product means that purchasers need much less investment in inventory, yet still can have a prompt, adequate shipment.

There are a rapidly growing number of situations where the standardization problem is larger, broader and more complex. A new standard product satisfactory to two companies, however, cannot adequately fill the needs of a national standard. On such problems I heartily recommend the services of the American Standards Association.

A Standards Program

Today there are more than 1600 American Standards that have been voluntarily arrived at and are voluntarily followed. Let me give you an example of a standards program:

Last December, a general conference of representatives from 119 organizations requested ASA to take the first steps in drawing up standards in the field of industrial nuclear energy. ASA-appointed committees and sub-committees have reviewed the work already done and have made recommendations on setting up sectional committees for developing American Standards. In addition, they are studying the work of existing committees with a view to suggestions on additional work on nuclear energy.

I mention this for several reasons. It is an historic standards operation; it is the first time in history that a major industry has undertaken to draw up standards in its early stages — in advance — by plan and design. If we'd followed past practices, we'd permit our standards in nuclear energy to develop haphazardly now and painfully attempt to standardize later.

The strongest defense against a continued trend for costs of purchasing items to increase is the wider use of national standards that can be used by designer, manufacturer, and user. No one interest can possibly create a standard for all of them. Cooperation is essential.

Industry-wide cooperation on standards matters concerned with dimensions, quality and specifications is a completely legal type of endeavor. The ASA is the logical place through which to carry out such cooperation on the larger scale.

. . . *Continued on Page 32*

Don't Waste Hours ADJUSTING AND SETTING CONVENTIONAL DIES

when the "WALES-WAY" takes ONLY MINUTES!

A WALES TOOL

TAKES MINUTES TO SET

AND ELIMINATES HOURS OF

- set-up time
- press down time
- setting stripping guides
- counter-boring for springs
- setting heavy stripper plates
- die buttons, etc. etc.

WALES MOBILE TRUCK UNITS

We have a well-equipped Motor Truck . . . a shop on wheels . . . that will demonstrate "WALES-WAY" methods right at your door. We will gladly arrange to have you see and use this demonstration. Please let us know a suitable time.

A Typical Foreman says:

"That's the way it's been around this shop for years. Still would be if the boss hadn't heard about WALES Hole Punching UNITS. What a deal.

"Instead of building a new die for each pattern, setting it in, lining it up and constantly checking to make sure punch and guide register, instead of watching every down stroke of the press ram, watching the special punch plates, stripper plates, die buttons and all the rest of time cosuming detail . . .

". . . we do it the "WALES-WAY" *now*. We set up a group of these self contained, individual WALES UNITS, one group for each pattern. We do it *fast;* so fast that our first run is on the punch press the same day. We can set up in minutes, change in minutes, shove work through faster than ever before because of the automatic guide principle that keeps the run accurate to the hair line from first to last ram press stroke."

WALES UNITS may be used over and over again. No dead storage. No enormous files of dies, plates etc. to be combed over for a re-run. This wonderfully flexible method requires a minimum of equipment at a minimum of cost. Saves hours and hours in your shop. Makes plenty of additional profit on every run.

No die-set needed, no pressure pads, no stripper plates with WALES UNITS. Punches, stripping guides, springs and guide buttons are all component parts of the UNITS—not attached to the press ram. WALES UNITS have a shut height of 5½" so only one adjustment of the ram is needed.

WALES ENGINEERING SERVICE • Our Engineers will survey your shop, your work, your methods if you wish, entirely without obligation. You'll receive valuable information and suggestions for time saving and EXTRA PROFITS.

Send for
BULLETIN NO. 11G

This folder contains much information that should interest you. Pictures and data to help you judge the merits of "the WALES-WAY"

WALES-Strippit CORPORATION
"...the Wales-Way is the PLUS-PROFIT way"
345 PAYNE AVE.— North Tonawanda, N.Y.
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONT.

don't lose a day. w
E 4½
75 TON
THE HOTTEST O.B.I.

lay. without the spectacular facts

TOTALLY ENCLOSED
BRAND NEW FROM THE GROUND UP

Rugged, front-to-back crankshaft with huge crankpin
Fully concealed, yet accessible, driving mechanism
Enclosed, rigidly supported gearing-operates in sealed oil bath
Electro-pneumatic friction clutch on crankshaft
Wider spaced, longer, narrower gibs
Wider, box type slide all within gibbing
Precision, hardened, longer-wearing gears
Compact, straight-line, space-saving, all-steel frame

This is it! The most talked about press in the world! The press that captured the hearts of the entire industry at the Machine Tool Show! The press that was born to do more than any O.B.I. ever built!

Get the spectacular facts and figures on this metalworking marvel . . . the all-new Niagara Series E, Front-to-Back Crankshaft Inclinable. It outmodes everything within its range (75 to 200-ton capacities, 4 ½ to 7 ½ inch shaft diameters, standard and automated models).

.I. PRESS IN HISTORY!

SOLIDED WITH SCORES OF
TECHNICAL IMPROVEMENTS

No overhanging gears, flywheel and other mechanisms.
No damaging crankshaft deflection
Full support to wide dies — no overhang on slide
Greater resistance to off-center loading
Accurate alignment of slide, with minimized tendency to cock
Substantially increased die life
Smoother, safer press performance — simpler, thriftier servicing
Less floorspace required

just send this...

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N.Y.

Please rush new Bulletin 56 with all the facts on your brand new Series E Inclinable.

Name _____ Title _____
Company _____
Address _____
City _____ Zone _____ State _____
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to get this...

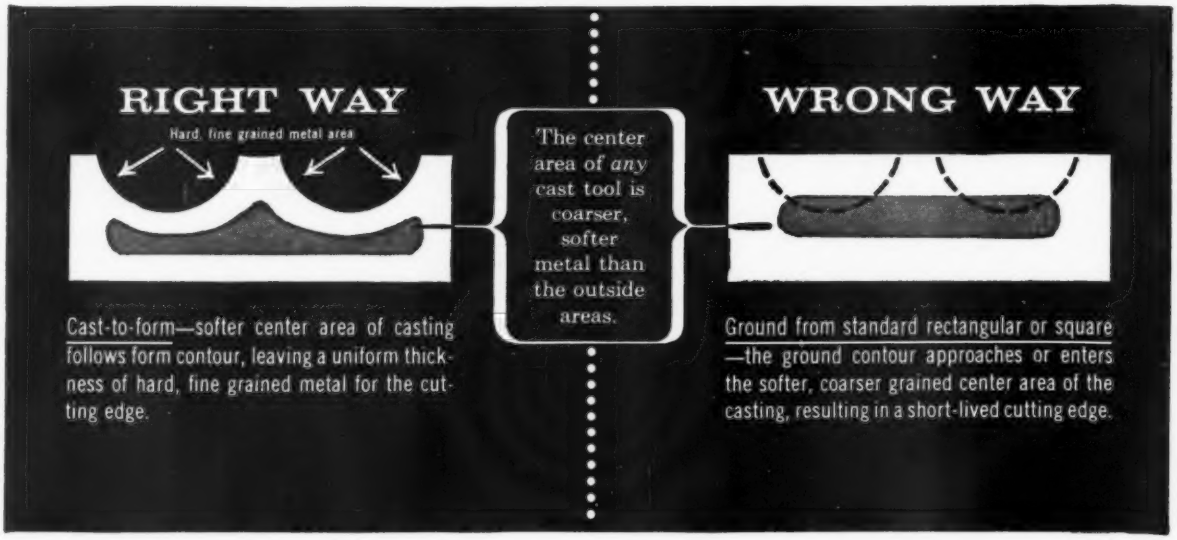
26 FACT-FILLED PAGES

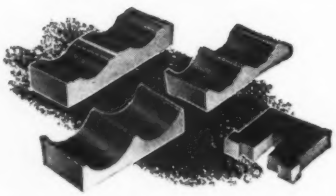
NIAGARA

front-to-back crankshaft
INCLINABLE PRESSES

America's Most Complete Line of Presses, Shears, Press Brakes, Other Machines and Tools for Plate and Sheet Metal Work.

HOW TO GET LONGER-LASTING, LOWER COST CAST ALLOY FORM TOOLS


RIGHT WAY
Hard, fine grained metal area
The center area of *any* cast tool is coarser, softer metal than the outside areas.
WRONG WAY
Cast-to-form—softer center area of casting follows form contour, leaving a uniform thickness of hard, fine grained metal for the cutting edge.
Ground from standard rectangular or square —the ground contour approaches or enters the softer, coarser grained center area of the casting, resulting in a short-lived cutting edge.



TANTUNG IS NOT HIGH SPEED STEEL —
it is an exclusive alloy cast to hardness with no subsequent heat treating!

TANTUNG CUTS FASTER—twice as fast as high speed steel. It bridges the gap between maximum speeds possible with high speed steel and minimum speeds practical with cemented carbides.

TANTUNG CONTAINS CARBIDES—of tungsten, tantalum and columbium. This combination gives it superior toughness and lower friction coefficient than ordinary cast alloys.

TANTUNG HAS HIGH RED HARDNESS—it maintains cutting hardness at red heat temperatures well above that of high speed steel.

TANTUNG IS STRONGER—transverse rupture strength about double that of most cast alloys.

Get the Cost-Cutting Edges from the V-R man. Call your local V-R distributor or representative.

Specify V-R TANTUNG Cast Alloy Preformed to your Prints!

Cast-to-form tools last longer! TANTUNG cutting tool alloys are chill cast in permanent molds to impart fine grain structure, high hardness, and high transverse rupture strength—characteristics which permit very high cutting rates and insure long tool life.

By specifying form tools *cast-to-shape* you retain these desirable characteristics. But, as shown in the drawings above, if you grind the form into standard rectangular or square cutting tools, you will approach or penetrate the coarser grained center area of the casting and destroy the very advantages for which you chose TANTUNG in the first place! (This softer center area is common to *all* cast cutting tools because this is the last point to solidify and is not subject to the chill condition on the outside of the casting.)

Cast-to-form tools cost less! The slightly higher original cost of buying your TANTUNG tools cast-to-form is saved many times over by elimination of form grinding costs, faster cutting, longer tool life with more regrinds possible, and reduced downtime for tool changes.

ASK FOR CATALOG

24-page V-R TANTUNG Catalog gives technical data and lists solid tool bits, tipped tools, cut-off blades and toolholder inserts. Write today or call your V-R Distributor or Representative.

MANUFACTURERS OF CEMENTED CARBIDES AND TANTUNG CAST ALLOYS • TOOLS • BLANKS • TOOLHOLDERS • INSERTS • DIES

Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

888 Market Street • Waukegan, Illinois

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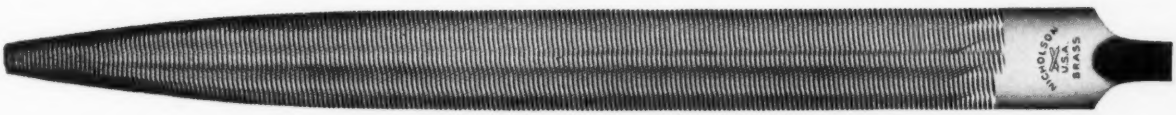
T-564

CIRCLE INFORM-A-GRAM KEY NO. 22

POP TOL' TH' NEW GUY TO USE "SPECIALIST" FILES!
SO HE RIGS HISSELF OUT LIKE ONE A THEM HIGH-PRICED MEDICS!
POP'LL TEACH 'IM TO PRESCRIBE TH' RIGHT FILES FOR TH' JOB!



The Right File for the Job pays off in faster cutting, longer wear and better, smoother work. There are Nicholson Special Purpose files for Aluminum, Brass, Lead, Stainless Steel and other hard-to-work materials, for Foundry and Die Casting work, plus Swiss Patterns in hundreds of shapes and sizes.

These are "specialist" files. And they're made by a "specialist" company. Nicholson File Company has been making files—and nothing but files—for more than 92 years. Carefully. Conscientiously. With unremitting research and development to keep pace with the filing requirements of industry.

Most of "Pop's" knowledge of file care, selection and use is in the 49-page "textbook," *File Filosophy*. It may pay you to write for your *FREE* copy today.

NICHOLSON U.S.A.

NICHOLSON FILE COMPANY, PROVIDENCE, RHODE ISLAND
(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

BLACK DIAMOND U.S.A.

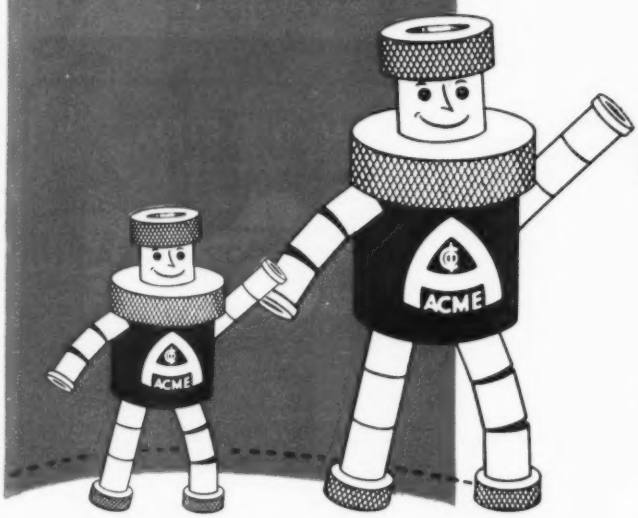
NICHOLSON FILES *A FILE FOR EVERY PURPOSE*

CIRCLE INFORM-A-GRAM KEY NO. 23

Now...a complete line of

ACME

Drill Jig BUSHINGS



MICRO BUSHINGS

STANDARD BUSHINGS

- ☆ Only ACME offers you two standards: A.S.A. and ACME – #80 to 2"
- ☆ Standard sizes from your local distributor's stock – *special sizes on request*
- ☆ Standard catalog tolerances
- ☆ FREE catalog and price list

Write for information and prices on micro, standard and tungsten carbide drill jig bushings, dowel pins, chamfer micrometer gages and portable bench centers.

ACME

ACME INDUSTRIAL COMPANY

206 North Laflin Street • Chicago 7, Illinois • Phone MOnroe 6-4122

CIRCLE INFORM-A-GRAM KEY NO. 24

Gardner-Denver... Serving the World's Basic Industries

New tool balancers boost production... relieve fatigue

Seven new Keller Tool Balancers designed to increase production . . . reduce fatigue . . . prevent tool dropping damage. Three models for light suspension of screw drivers, nut setters, drills, tappers. Four models for heavy-duty balancing in 20—30—40—50 lb. capacities.

★ **LONG SERVICE—oilless alloy bronze bearings.**

★ **ADJUSTABLE CABLE STOP—shock-resisting bumper.**

★ **CABLE GUIDE—keeps proper position on drums.**

★ **STRAIGHT-LINE PULL—eliminates excessive wear.**

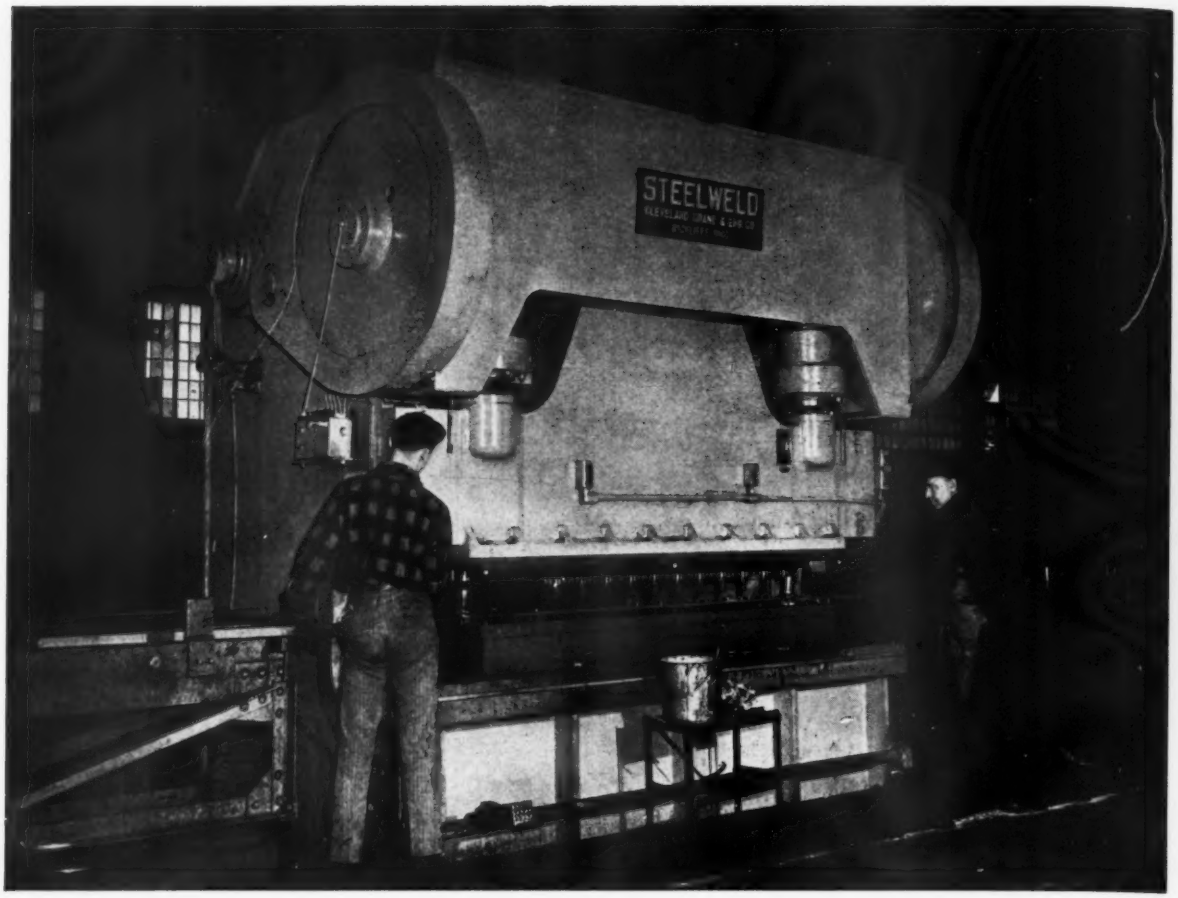
Many other features. Ask for Catalog Section 65.

GARDNER-DENVER

KELLER TOOL division, Grand Haven, Michigan

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

CIRCLE INFORM-A-GRAM KEY NO. 25



Model K5-8 Press, one of two Steelwelds in continuous 24-hour service since 1945, punching a series of holes in bridge floor bars.

2,000 Bars slotted every 8-Hour shift

Although originally conceived as machines for bending metal, Steelweld Presses are now serving a wide variety of uses. Two large Steelwelds at the MacDonald, Ohio Plant of the Carnegie-Illinois Steel Corporation are used solely for punching slots in steel bars, beams and T-sections for bridge flooring.

The time of one press is devoted largely to punching slots in bars 1⅝" and 1-7/16" wide by ¼" thick by 6'-2" long. Each bar contains 13 slots ½" wide by ⅝" to ⅞" long, and 24 slots ¼" wide by ⅝" to ⅞" long, a total of 37 slots all punched at one time. Two thousand bars are slotted in an eight hour shift.

Another standard job is that of punching 2-inch long slots on 4-inch centers in I-beams for bridge sections. These are punched 24 at a time. The beams vary in length from 24'-0" to 45'-0". Two hundred 40'-0" beams are punched in an 8-hour period.

Both Steelweld Presses have been in this service 24 hours a day since 1945.

GET THESE BOOKS!

Catalogs No. 1010 (Presses) and No. 1011 (Shears) give construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

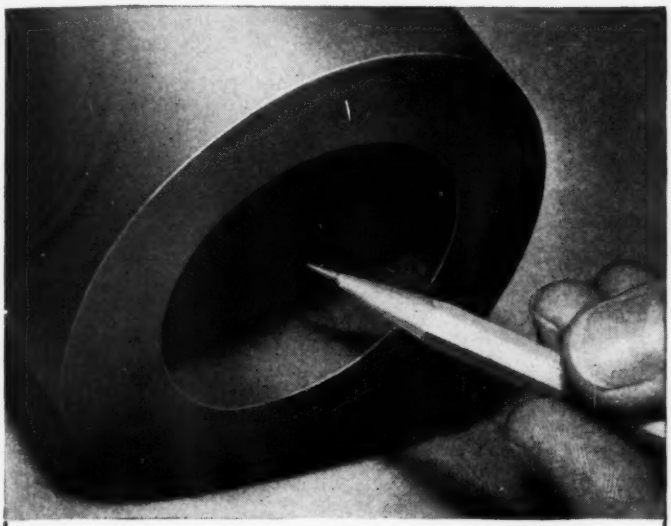
8732 E. 281 ST. WICKLIFFE, OHIO

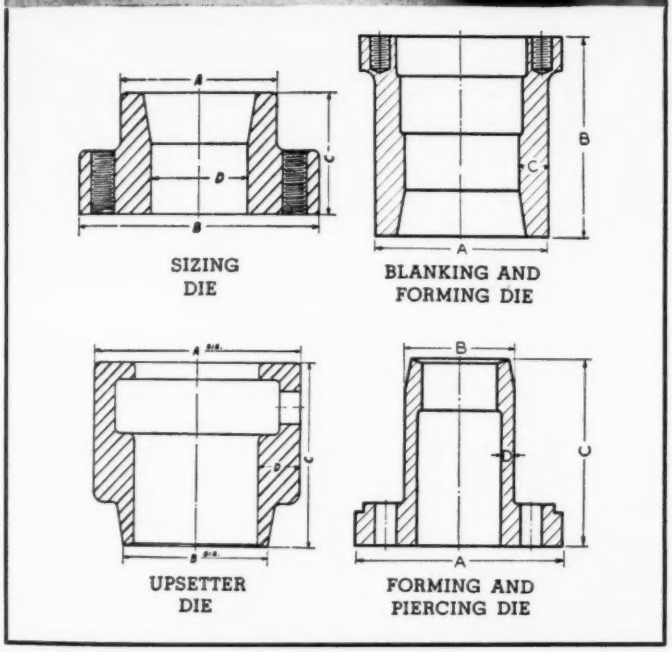
STEELWELD

PRESSES and SHEARS

CIRCLE INFORM-A-GRAM KEY NO. 26

SPEED PRODUCTION, CUT WASTE WHEN MAKING RING-SHAPED TOOL STEEL PARTS





New Graph-Mo® Hollow-Bar eliminates drilling, machines 30% faster

IF you make ring-shaped tool steel parts, you'll find that you can speed production, cut waste, and save steel by using Graph-Mo® Hollow-Bar. That's because Graph-Mo Hollow-Bar comes with the hole already in it. There's no drilling. You start with finish boring.

And with Graph-Mo Hollow-Bar you get the combination of proved advantages that have made Graph-Mo one of the most popular tool steels: excellent machinability, exceptional wearability, unsurpassed stability.

Actual tests prove that Graph-Mo machines 30% faster than other tool steels. That's because Graph-Mo has free graphite in its structure. And this free graphite gives Graph-Mo less tendency to pick up, scuff, and gall.

Graph-Mo's amazing wear resistance stems from a combination of graphite and diamond-hard carbides. Reports from users indicate that Graph-Mo outwears other tool steels on an average of three to one.

Graph-Mo also is the most stable tool steel ever made. A master plug gage made from this steel showed less than ten millionths of an inch dimensional change after 12 years in use. And Graph-Mo responds uniformly to heat treatment, too.

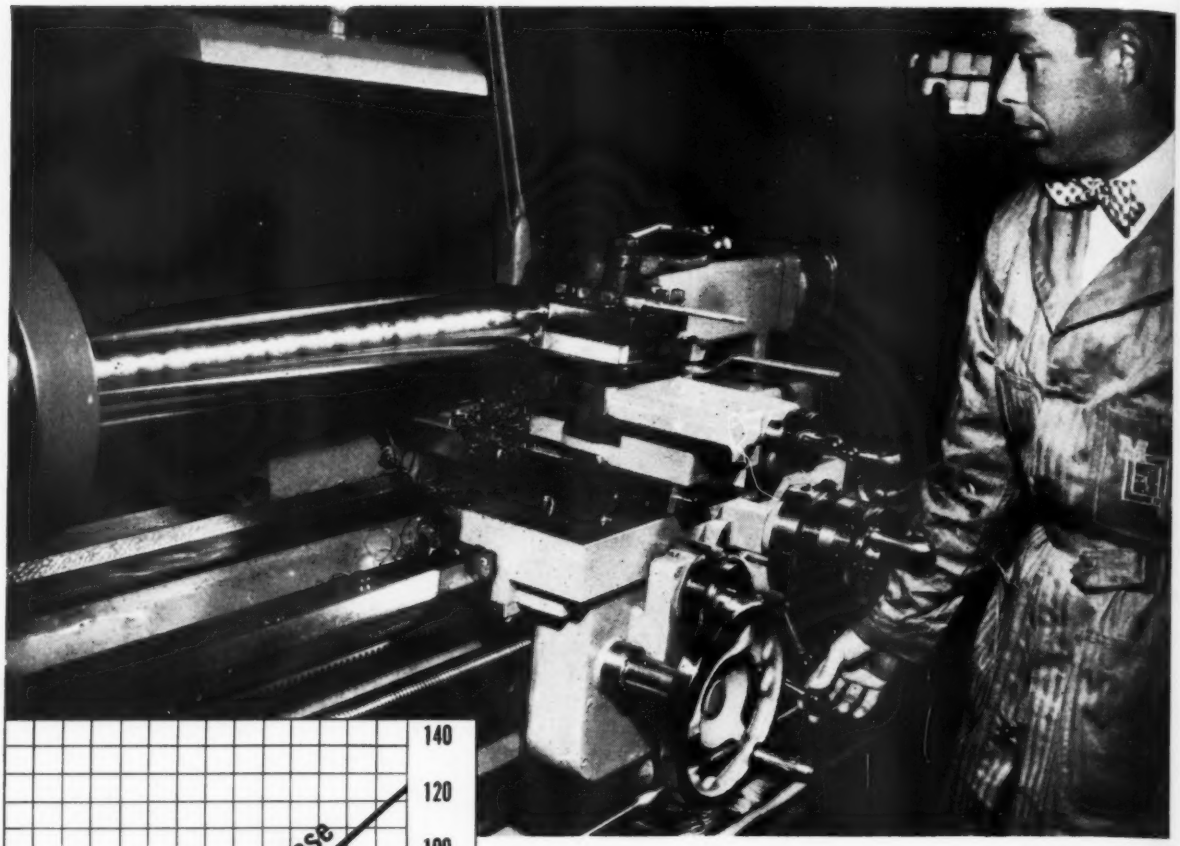
Makers of ring-shaped tool steel parts may obtain Graph-Mo Hollow-Bar in sizes from 4 to 16 inches O.D. with various wall thicknesses.

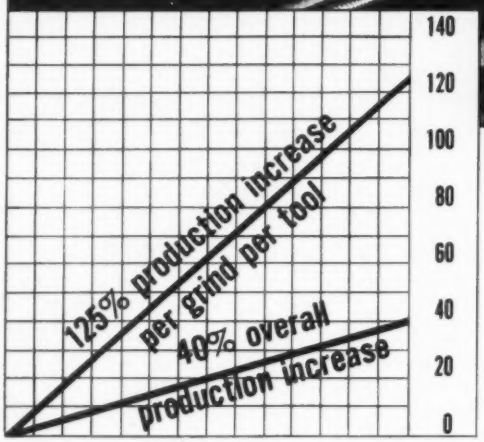
To learn more about Graph-Mo Hollow-Bar, and its application to your problems, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

CIRCLE INFORM-A-GRAM KEY NO. 27





Lathe Shaft production UP 40% with new Firthite TXH Carbide

Wherever used, *new* FIRTHITE TXH Carbide is proving its competitive superiority . . . as at Boyé & Emmes Machine Tool Company, Cincinnati, for turning lathe shafts from 3 inch SAE 4140 un-annealed steel.

Here's what they found:

- Overall production went up 40%.
- Production increase of 125% per grind per tool.
- Twelve shafts per tool without regrinding.
- Only .0010 flank wear in 12 cuts.

Impressive? You bet! So much so that many tool engineers have acclaimed TXH as the most nearly "universal" grade of carbide yet developed. That's because TXH is an entirely new concept in carbide metallurgy . . . a combination of materials and processes designed specifically to do heavy-duty, high-production cutting operations better than they have ever been done before. And while a distinctly *premium grade,* TXH is not *premium priced!*

You try it. It's available from stock in all standard tips, tools and inserts.

TXH ADVANTAGES

- Higher hardness to strength ratio
- Improved impact resistance
- Wider range of applications
- Lower operating temperatures
- Higher edge strength
- Greater resistance to abrasion

R-317

Firth Sterling
—INC—

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MILLS: McKEESPORT, TRAFFORD, DETROIT, HOUSTON
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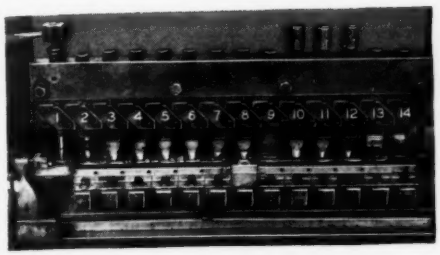
PRODUCTS OF FIRTH STERLING METALLURGY

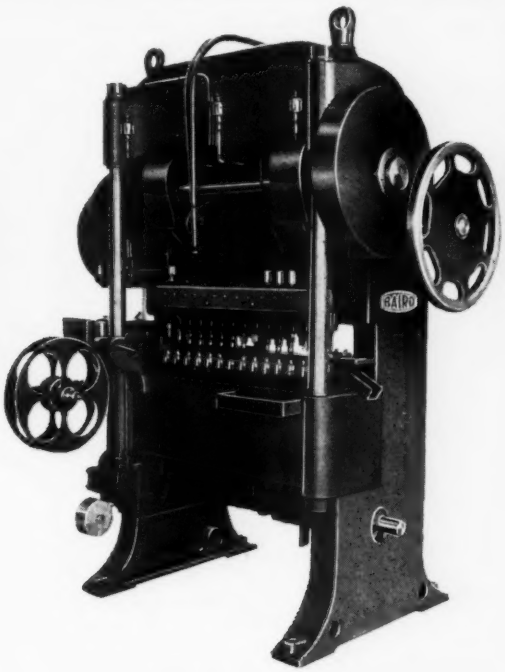
High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets
Zirconium

CIRCLE INFORM-A-GRAM KEY NO. 28

...ask BAIRD about it



A complete die set with full complement of punches and dies in working position and with transfer in loading position. Note accessibility of all mechanisms and adjustments.



What is so different about BAIRD Multiple Transfer Presses

Many still confuse these advanced high production machines with multiple-slide presses (commonly called eyelet machines) or with equipment using progressive dies.

They are, in fact, entirely different . . . and the advantages of Baird design result in much more flexible and versatile tooling . . . much less down-time for initial tooling, maintenance and change-over . . . use of minimum width stock . . . maximum production speeds smoothly maintained.

In addition, Baird Multiple Transfer Presses can maintain closer tolerances than previous methods on high production of parts requiring from 8 to 15 consecutive operations.

So smoothly do these machines operate that old-time press-room clatter is a thing of the past. Normally, long production runs at high speed may be maintained without adjustment down-time.

If you are looking for the most modern equipment available for volume production of press-produced parts . . . by all means "ask Baird about it." Our development of the Baird Automatic Multiple Transfer Press has set many new standards in this field. Write Dept. TP.

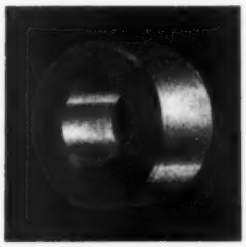
AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC FEEDERS • TUMBLING BARRELS

THE BAIRD MACHINE COMPANY
STRATFORD CONNECTICUT

28A56

CIRCLE INFORM-A-GRAM KEY NO. 29

precision reaming CUTS HOLE FINISHING COSTS



BARBER-COLMAN offers

Close control of size and finish

Consistent duplication of accuracy

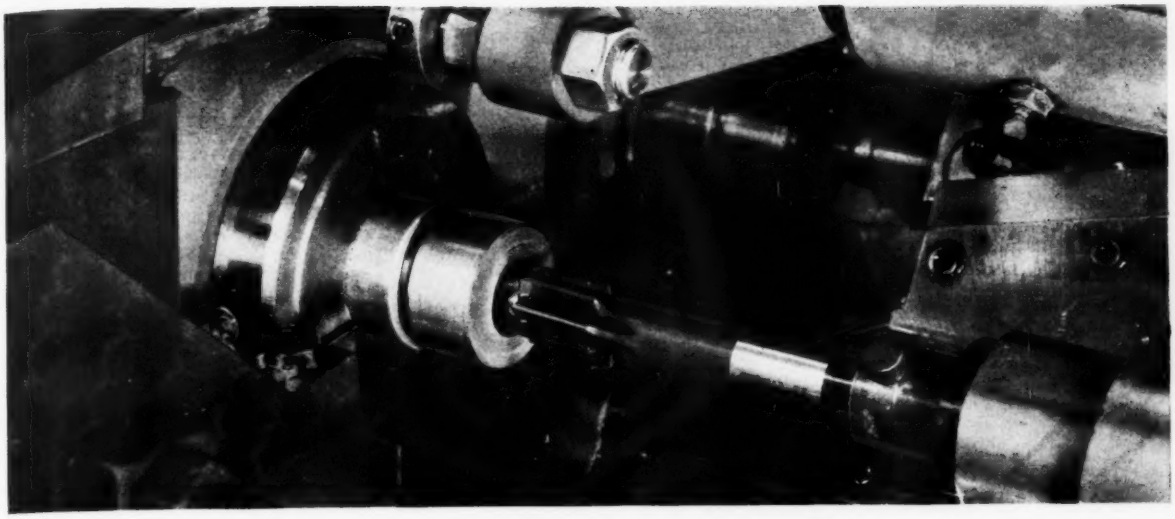
Minimum finishing stock

Fewer finishing operations

Important job economies are being obtained in hole finishing operations with Barber-Colman standard "oil feed" reamers. Close control of size and finish reduces the number of finishing operations required and results in shorter finishing time. Because reamer diameters are held to a tolerance of +.0002", −.0000", reamers can be drawn from stock and put to work immediately on the machines, with assurance of consistent hole accuracy. This eliminates the usual machine downtime for hand working the reamers and size checking.

Through careful tool design and accurate sharpening, reamers are made to suit the specific job characteristics, so that better cutting action produces fewer stresses, and

Barber-Colman Oil Feed Reamer



consequently less distortion in heat treating. As a result, less finishing stock is required for honing after hardening.

Cost savings benefits such as these are evidenced in the Barber-Colman "oil feed" reamers used to size bores in planetary gear blanks. Blank bores are finished within .7536"/.7543" I.D. to 15-60 rms. Since reaming produces blanks within the close tolerances required for accurately cutting the gear teeth, a series of successive finishing operations formerly required have been eliminated, greatly reducing cost per finished hole. Minimum stresses produced as a result of reaming confine heat treating distortion to normal shrinkage of the hole. Consequently, in this case, the hole is reamed to final size, and it is only necessary for honing to remove the amount of shrinkage. The job facts as shown illustrate the production accuracy and finish obtained:

Barber-Colman reamer design produces sharp cutting edges with positive primary clearance on the land, rather than a cylindrical land, to provide a shearing action cut. These sharp edges with irregular flute spacing produce smooth cutting with uniform finish and accuracy which cannot be obtained with conventional reamers. These reamers also have a slight right hand helical flute with an oil hole drilled through the center of the reamer so that the cutting oil will force the chips back between the flutes, contributing to fine finish.

Semi-Finished Bore Diameter	.7536"/.7543"
Maximum Taper Allowable	.0001"
Bore Square and Parallel with Face of Blank	.0003"/.0005"
Concentricity with O.D.	.002"
Production	200 Blanks per Hour
Cutting Time	17 Seconds
Cutting Speed	302 rpm.
Stock Reamed	.008" to .009"
Finish	15-60 rms.
Bore Depth	.820"
Feed	.025"

When you have hole finishing problems involving close limits of accuracy and a series of operations, call a Barber-Colman reaming expert and talk over with him the most economical way to get the finish and accuracy you want. You will find substantial production savings possible, both in cost and time.

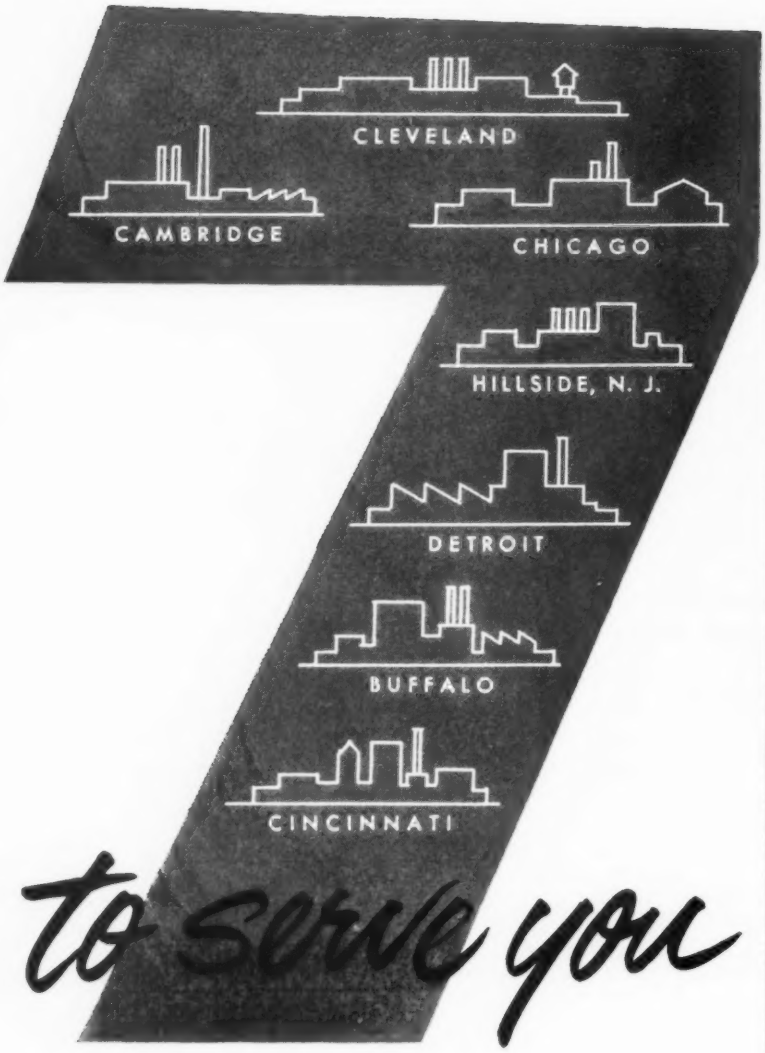
BARBER-COLMAN COMPANY

9108 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

CIRCLE INFORM-A-GRAM KEY NO. 31

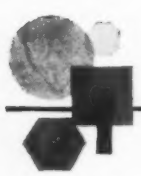


A call to any one of our seven warehouses will get you speedy service on your order . . . whether it's for *alloy steel bars, billets or forgings,* in any size, shape or treatment you need.

All seven warehouses are located in principal industrial areas. Each is modern and well-stocked, and staffed by expert metallurgists.

Call now if you need our own HY-TEN steels – "the standard steels of tomorrow", or standard AISI or SAE grades.

Or write for *free* copies of Wheelock, Lovejoy Data Sheets. They contain complete technical information on grades, applications, physical properties, tests, heat treating, etc.



In Canada: Sanderson-Newbould, Ltd., Montreal and Toronto

WHEELOCK, LOVEJOY & COMPANY, INC.

135 Sidney Street, Cambridge 39, Massachusetts

CIRCLE INFORM-A-GRAM KEY NO. 32

. . . Talk of Month, from Page 18

One further step your leadership might accomplish in your own company is the education of top management as to the importance of standards in today's industrial economy. Too many chairmen, presidents and vice presidents still look upon standardization as simply a technical function of production. And top management usually delegates technical functions to the experts in charge of the various departments of the company. In a complex, interrelated economy like ours, this delegation can be overdone.

Standardization today is a true management function that should not be completely delegated to others because some of our greatest future areas of cost reduction lay in the area of the increased development and use of American Standards.

The concept and use of standards is a key concept in management control, coordination, integration, planning and continued profits. You have a most important responsibility to constantly drive for more standardization among your outside contacts and within your own company. Your continued efforts for maintaining standardization will result in reducing costs and increasing profits through purchasing.

"CUSTOM" CARBIDES WALMET'S SPECIALTY

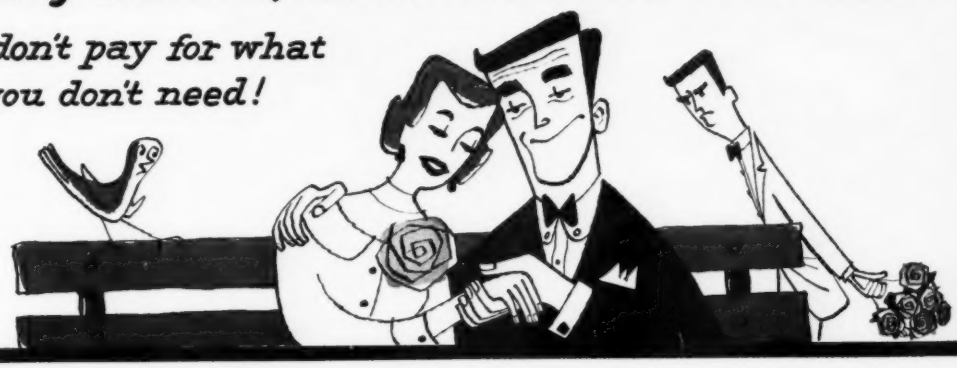
Development and manufacture of "custom-made" grades of cemented carbides for users' specific requirements are the tasks being undertaken by newly-formed Walmet Corporation. The company's new facilities were recently completed in Detroit's suburb of Madison Heights.

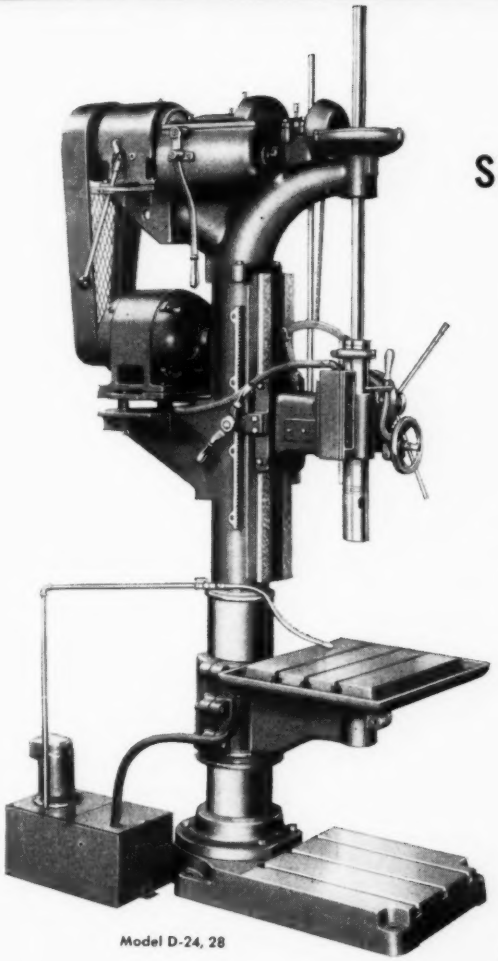
According to Walmet President Einar Almdale, newly-acquired equipment enables the company to vary metal composition and structure, in reasonable production quantities, to produce a finished carbide part with the exact physical properties required by a specific application.

The company is equipped to produce metal cutting carbide blanks in standard shapes and sizes, including "throw-away" insert blanks for mechanical holders, modified standard blanks, rectangle strips, solid rod, solid and flattened cylinders, woodworking blanks, and special wear resistant carbide blanks.

Don't buy a BOUQUET...when a ROSE will do!

...or don't pay for what you don't need!





Model D-24, 28

SIBLEY DRILLING MACHINES...

- **Drill 1¾" in Steel Plate.**
- **24" and 28" Swing. 5 H. P. Motor**
- **Table Swings On Round Column— Save Set-up Time! Get More Versatility!**
- **Accuracy—Simplicity**
- **Ruggedness For Any Job!**

Increase Output at ½ the Investment!
Simple arithmetic proves the Model D-24 a money-maker for you. Charge its cost to your work and compare! Meeting close tolerances reduces rejects. Ease of operation and simplified tooling cuts time. Accessibility permits easy repair.

Send for Free Catalog!

SIBLEY
MACHINE & FOUNDRY CORP.
SOUTH BEND, INDIANA

SIBLEY MACHINE & FOUNDRY CORP.
Dept. TP 8 South Bend 23, Indiana
Send Catalog No. 68A

Name_____ Title_____
Company_____
Address_____
City_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 33

KALAMAZOO

...worth more to you

MODEL 8CW

If you are interested in cutting costs and increasing production—maintaining extreme accuracy with the latest designed horizontal metal cutting band saw machine — write for complete details or contact your local Kalamazoo distributor.

MACHINE TOOL DIVISION

Kalamazoo TANK and SILO COMPANY

815 HARRISON STREET . . . KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 34

People Are Important

by Erwin K. Taylor, Ph. D.
President
PERSONNEL RESEARCH AND DEVELOPMENT CORP.
Cleveland 20, Ohio

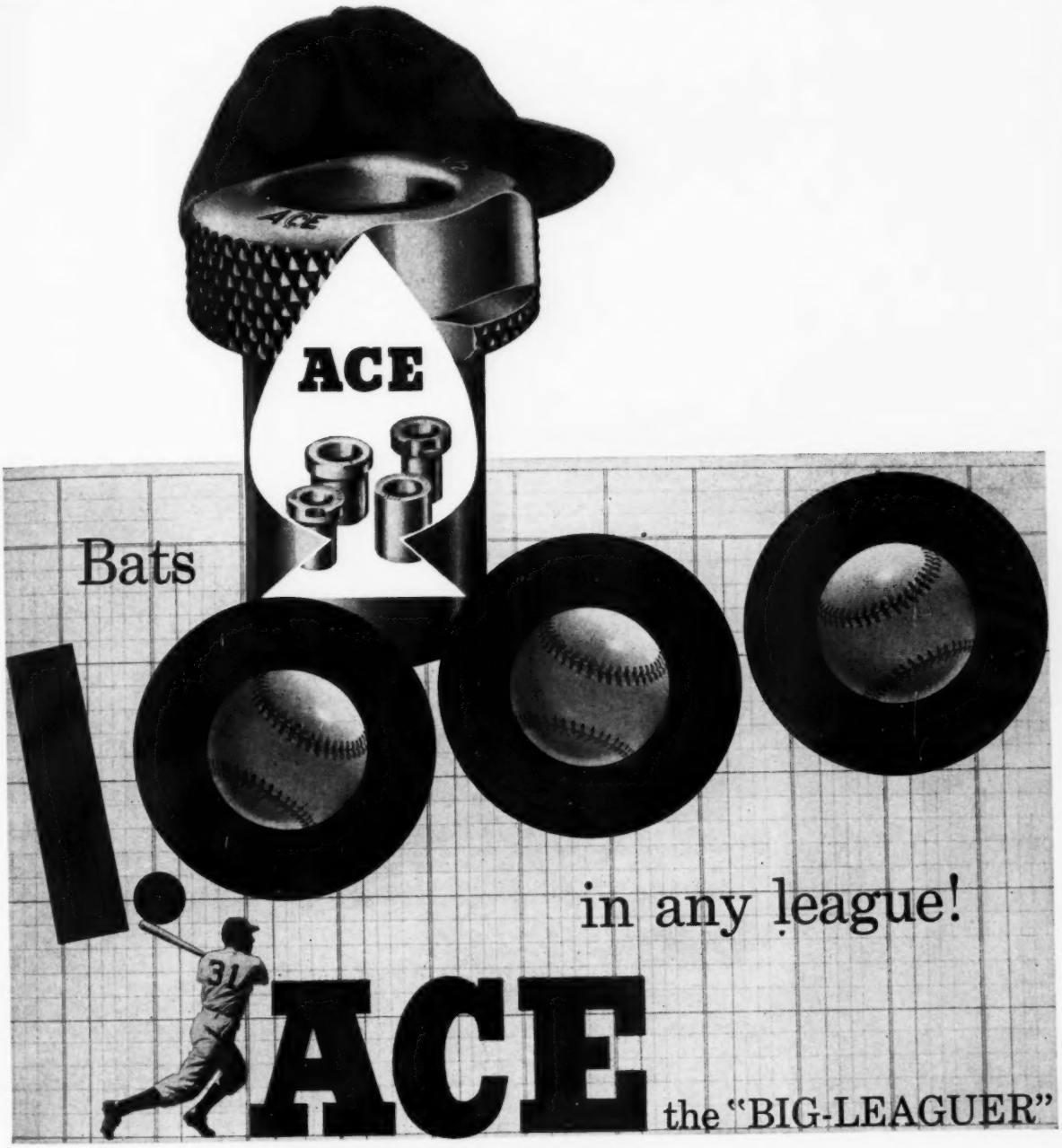
INDUSTRY'S TRAINING DOLLAR

HAVE YOU EVER stopped to wonder how much American industry is spending annually on supervisory training? I often have but have never generated enough energy to try and track down any reliable figures. I don't suppose that you need to make any extensive survey to appreciate that the figure must run into tens of millions of dollars. This is especially true if to the costs of training departments, outside seminars, training consultants, moving pictures and visual aids, you add the cost of the supervisor's time taken either for in-plant training programs or for being sent to special courses for from a few days to several months.

That training, particularly human relations training for management people, is important is a proposition to which almost everybody in industry will agree. But not all training is equally good, and you would think that top management — ordinarily cost conscious—would usually make a serious effort to find out what it was getting for its training dollar.

Yet this is far from the case.

When I was Contract Research Officer for the Personnel Research Section of the Adjutant General's Office, I initiated a survey which was conducted by the Psychological Corporation. Several hundred industrial organizations were contacted and dozens of training directors interviewed by the research staff. The survey found that few organizations had any systematic means of determining their training needs. More frequently than not it was either a matter of "the wheel that squeaked the loudest getting the grease," a dramatic error in some department that came to management's attention, or a pet theory on the part of some high ranking member of management. The picture with respect to training evaluation was, if possible, even worse. What little "evaluation" was reported was usually conducted by those responsible for the training and anxious to prove its success. Such "studies" generally consisted



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LARGEST DELIVERABLE STOCKS ANYWHERE

Write today for the all-new 1956 catalog containing Technical Data, Comparison Tables, Price Lists and Name of Dealer in your area.

ACE DRILL BUSHING CO., INC.
5407 Fountain Ave., Los Angeles 29, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 35

FINISHED AFTER HARDENING . . .

Hanson-Whitney

MULTIPLE THREAD MILLING CUTTERS

Over 35 years of experience in designing and manufacturing top quality multiple cutters has established Hanson-Whitney first in the field. Hanson-Whitney's exclusive *finished after hardening* process provides extremely close limits in tooth spacing, form and relief. Ground thread cutters assure minimum outside diameter run-out . . . does not restrict the length of thread to be milled, while maintaining tolerances of parallelism or desired taper.

Hanson-Whitney Cutter Insert design, where applicable, meets today's demand for savings in tool costs. Hanson-Whitney Adapters, to suit cutter spindle tapers, accommodate Cutter Inserts. Adapters and Cutter Insert Blanks are carried in stock to expedite delivery.

Hanson-Whitney alone offers *single source* product integrity — machine tools, cutting tools, and precision gages for screw threads . . . your guarantee of production perfection. Consult Hanson-Whitney engineering service in the field or at home address. Write for further information and literature —

Hanson-Whitney

COMPANY

DIVISION OF THE WHITNEY CHAIN COMPANY

172 BARTHOLOMEW AVENUE • HARTFORD 2, CONNECTICUT

TAPS • THREAD GAGES • HOBS • CENTERING MACHINES • THREAD MILLING MACHINES AND CUTTERS

CIRCLE INFORM-A-GRAM KEY NO. 36

of questionnaires asking those who had been exposed to the course how they liked it and how much they got out of it.

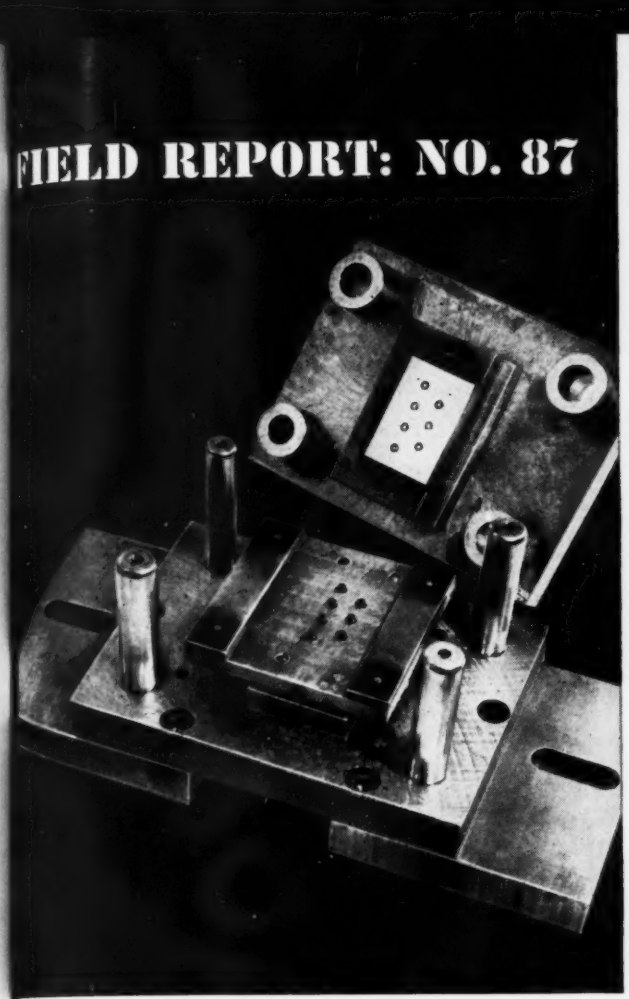
In a recent article in PERSONNEL, L. D. Korb says, "A review of the literature on the evaluation of training and a study of the evaluation provisions contained in a large number of supervisory development programs indicate that little has actually been done to measure supervisory training in terms of its effect on the productive efficiency and morale of an organization. Even in the few cases where studies of the impact of such training have been made, there arises the question of whether the supervisory training program was responsible for the improvements or whether other factors were involved."

Korb suggests as a minimum test of the effectiveness of supervisory programs the questioning of the participants and the securing of the judgment of the top executive. We reject both of these methods as practically worthless. Participants themselves are generally inclined to say "Yeah, sure, it was swell. I got a lot out of it," even when the "lot" may have been nothing more than a couple of hours a week away from their duty stations and the feeling of importance that comes from having been selected for training. Insofar as the top executives go, they are generally much too far removed from the day-to-day operations of supervisors to have any real knowledge of the extent to which a supervisory training program has changed the on-the-job behavior of the participants.

Also, since it is the top executives who usually either inaugurated or approved the installation of the program, it is difficult if not impossible for them to be completely detached in judging it. It would be only human for them to quite honestly "see" success in the program even where no real or objective evidence of the program's accomplishments exists. To attempt to prove that the decisions we have made were right and profitable is an almost universal characteristic to which all of us are prone.

Happily, there are a few exceptions to the rule that, in general, industry has made no realistic effort to determine what it has gotten for its training dollar. Probably the outstanding example of an industry's efforts to evaluate objectively a supervisory training program was the study conducted by the Personnel Research Board of Ohio State University for the International Harvester Company. A monograph describing this study in detail was recently published by the Ohio State University.

The International Harvester Company a number of years ago undertook to sponsor an ambitious super-



WHICH DIE STEEL WOULD YOU USE HERE to boost production per grind 500%?

These tools blank out dead soft brass washers, .170" O.D. x .100" I.D., .009" thick, on a punch press at 186 strokes per minute. It is an exacting job for a couple of reasons. First, it involves a government contract and strict delivery schedules have to be maintained. Then too, the punch and die are set up to blank seven washers per stroke and have to do this for many millions of pieces . . . and still remain within burr limitations set up by the government. Performance from the steel used in the past was far from satisfactory . . . to maintain schedules, production had to be substantially increased.

Suppose the decision were up to you. Which die steel would you be willing to recommend for steady, trouble-free production?

In this Field Report from customer files, here's what happened: The Carpenter Matched Set Diagram was consulted and Carpenter No. 610 (Air-Wear) was selected. Since then No. 610 has enabled the Company to hold delivery schedules comfortably . . . racking up increases in production per grind as high as 500%. And this is especially significant when you realize that five hours' downtime is involved each time the tools have to be reground. Total parts to date: 5,500,000 . . . and the tool is still good for about 15 regrinds of .003" each.

Why make the tough decisions alone, when Carpenter's service organization is sincerely interested and equipped to work with you? A move in the right direction would be to call your nearest Carpenter Mill-Branch Warehouse, Office, or Distributor, now.

Your toolroom can use Carpenter Matched Tool and Die Steels to:

- Reduce hardening hazards
- Minimize machine downtime
- Boost output per grind
- Improve product quality

Carpenter STEEL

Matched Tool and Die Steels

IMMEDIATE DELIVERY from local warehouse stocks— The Carpenter Steel Co., 106 W. Bern St., Reading, Pa.
Export Address: Port Washington, N. Y.—"CARSTEELCO"

CIRCLE INFORM-A-GRAM KEY NO. 36

This question is in everyone's mind these days. Idle press time can eat up money so fast that it is forcing people to take a second look into their stamping operations. Many are finding that it's just too darned expensive to maintain their own stamping departments, even the largest ones. Frequently, it is less expensive in the long run to turn to specialists like Laystrom. We have the right press to fit each job, giving you maximum production at the lowest cost — consistent, of course, with Laystrom's traditionally high quality for stamping work.

A close look at "make or buy" is vital these days. If your decision is "Buy," you will do well to contact Laystrom. We have helped many people cut costs. Perhaps we can help you too.

Laystrom

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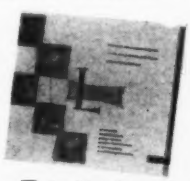


☐ We are sending drawings for quotation. ☐ Have salesman call. ☐ Send brochure only.

CIRCLE INFORM-A-GRAM KEY NO. 38

visory program to be conducted by the Industrial Relations Division of the University of Chicago. A special building was built for the purpose of the program, and supervisors from various International plants were sent to Chicago for a two week course in human relations. It is little wonder that with so extensive an investment, International Harvester felt the need to determine its effect upon the on-the-job performance of those supervisors who had been sent to Chicago for training. Wisely they selected an independent organization, The Personnel Research Board at Ohio State, to design and conduct the evaluation study. The project was a comprehensive one and we naturally do not have enough space to report it in detail. But we can pass on some of the more important findings.

This study started where most training evaluation studies end — by giving examinations to the foremen before and after training. As is usually the case, the trainees in the International study had learned to make the expected human relations noises and were much more able in the after-training test than in the before-training test to give back the "right" answers. But the researchers did not stop there. They devised measures of the foreman's on-the-job behavior. These instruments were filled out not by the foremen themselves or by their high-ranking superiors, but by the workers whom they supervised.

The results for a group of foremen who had attended the human relations training course were compared with those for a comparable group of foremen who had not been sent to school.

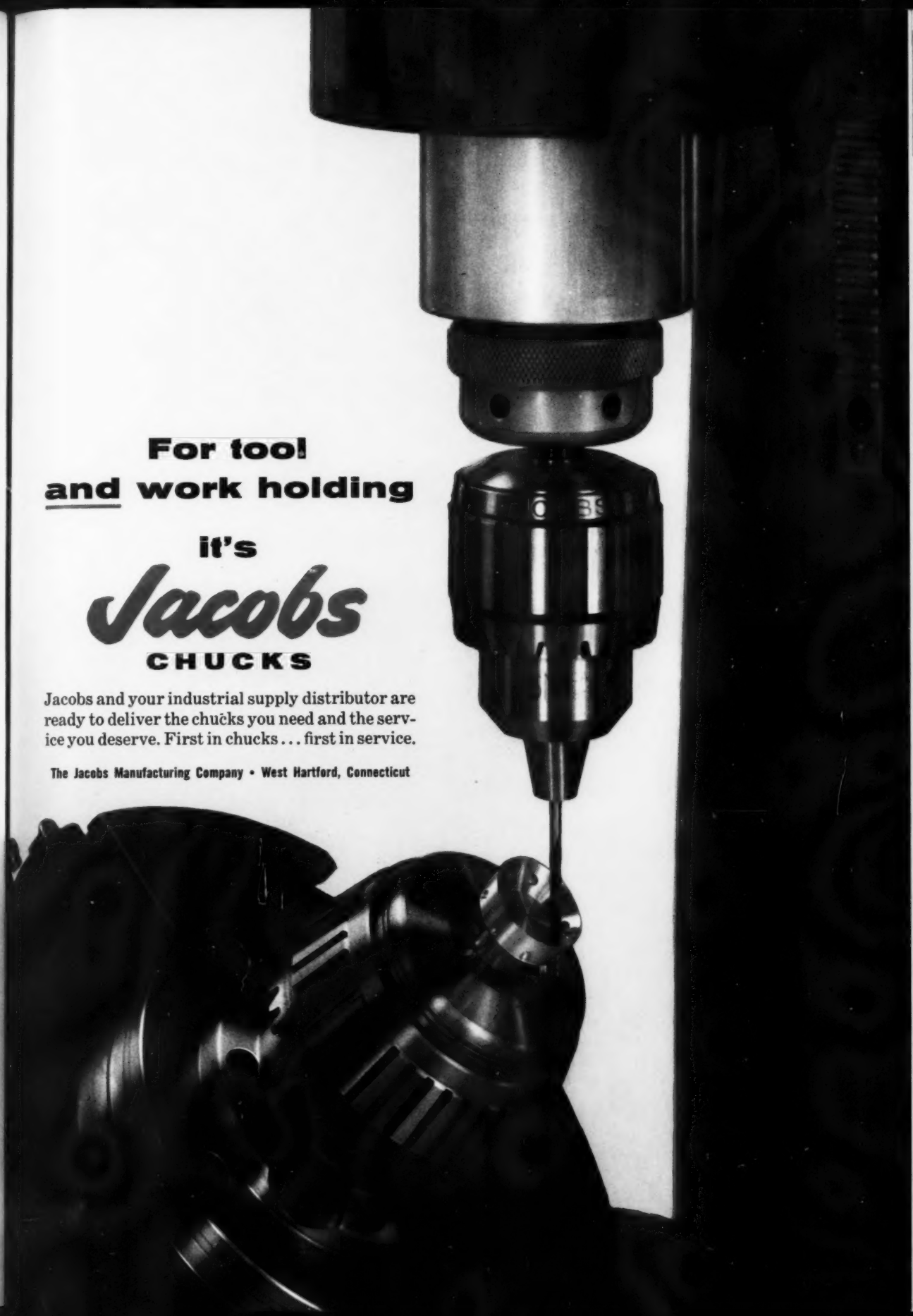
The results were shocking!

In terms of their on-the-job behavior as reported by their subordinates, foremen who had attended the human relations training program were on the average "worse" in their human relations than were those foremen who had not attended.

Of course, there is much more to the story than we have been able to report here, but this is sufficient to make our point. You can't depend upon the unsupported attitudes of the trainees or opinions of the executives as a valid way to evaluate a training program. Unless evaluation is accomplished by an independent group of technically qualified people, it is almost impossible for an industrial organization to find out what it is getting for its training dollar.

The Benjamin G. Lamme Medal was awarded last month to Robert M. Critchfield by Ohio State University. Mr. Critchfield is a General Motors vice president and general manager of the Pontiac Motor Division.

IMMEDIATE DELIVERY from local warehouse stocks— The Carpenter Steel Co., 106 W. Bern St., Reading, Pa.
Export Address: Port Washington, N. Y.—"CARSTEELCO"



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and work holding
it's
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Jacobs and your industrial supply distributor are ready to deliver the chucks you need and the service you deserve. First in chucks . . . first in service.

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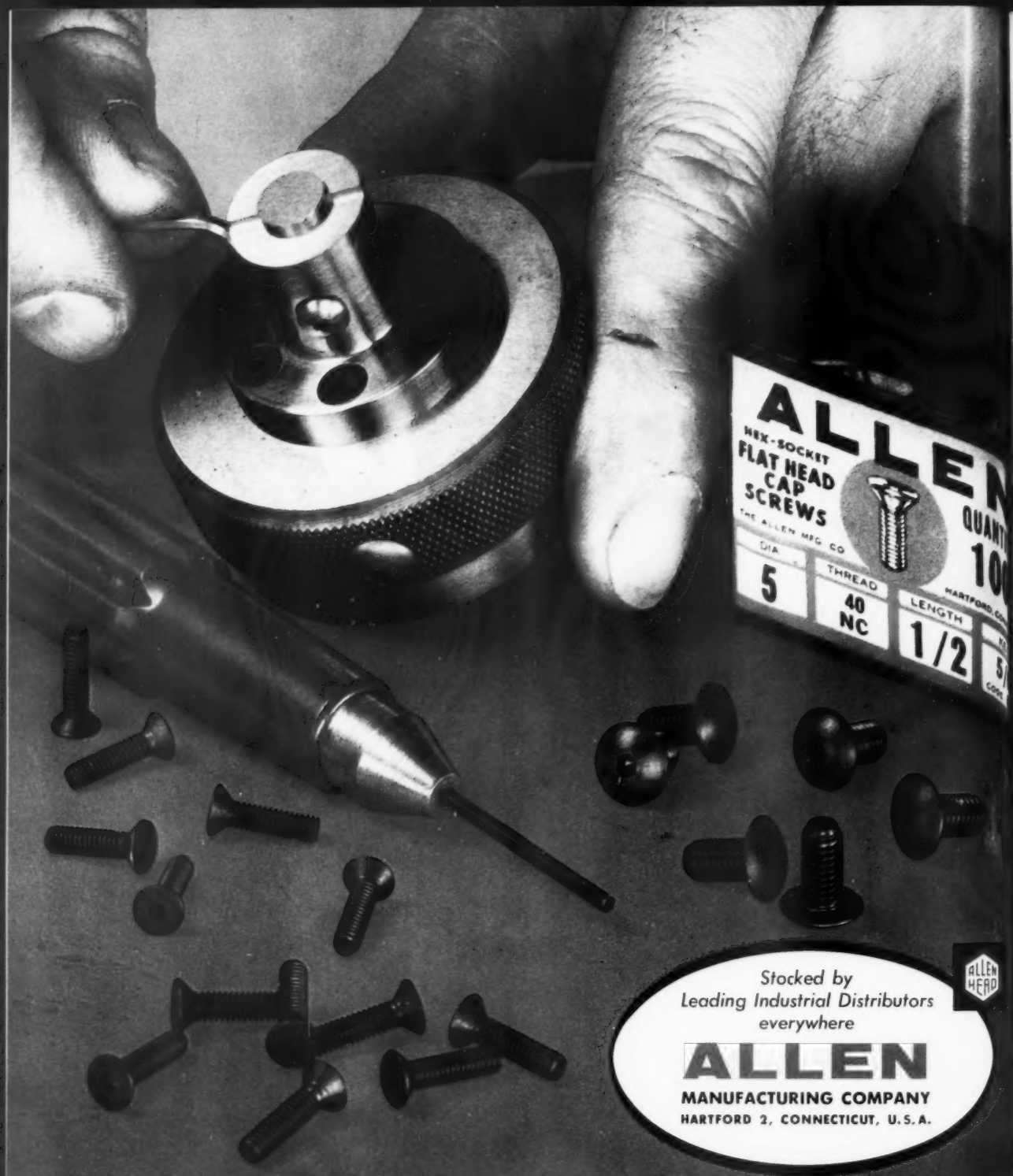

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MANUFACTURING COMPANY
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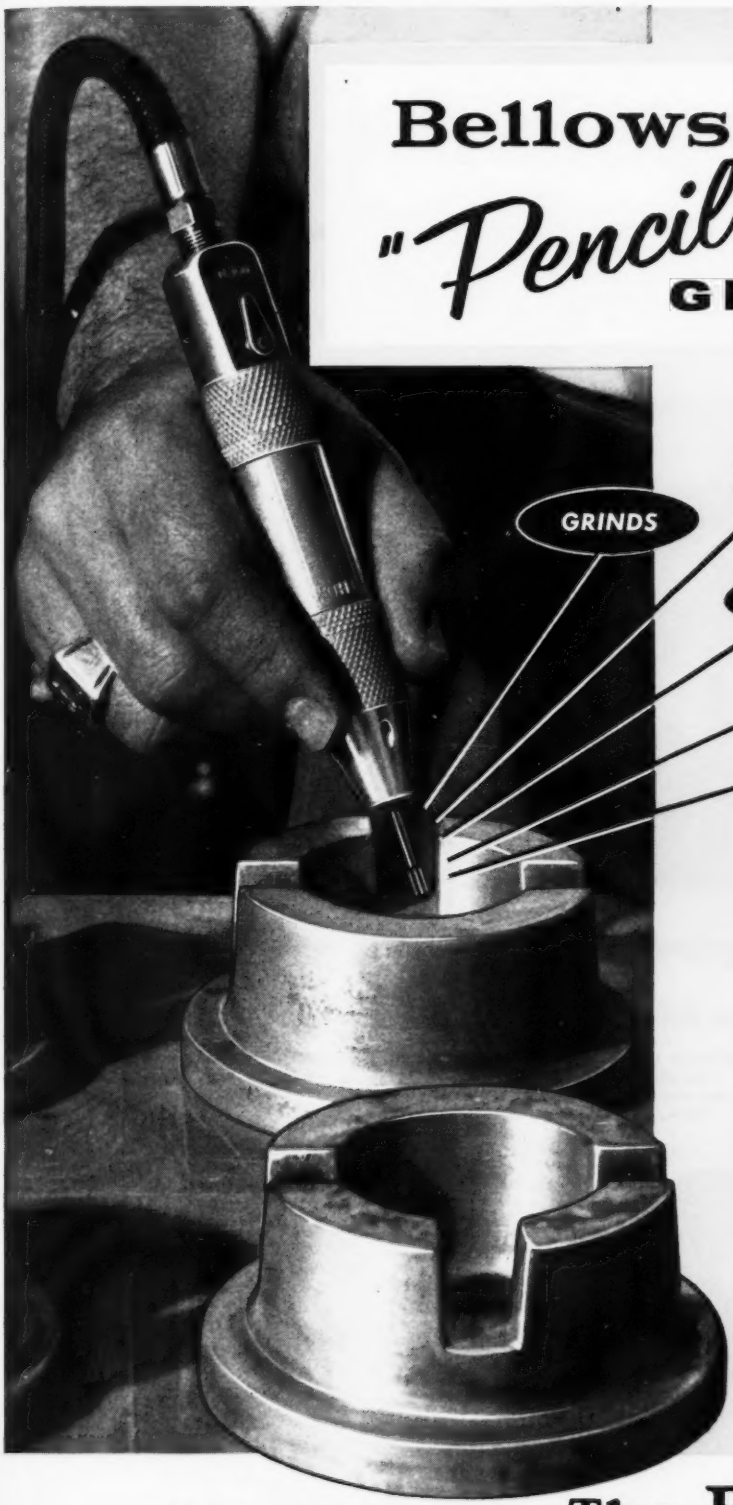
Your hardest fastening jobs are just what Allen Leaderpoint Cap Screws are made for!

Bellows "Pencil-Size" GRINDER*



Air powered—100,000 RPM.
No shop can afford to be without this fast, flexible, low cost tool. It grinds, deburrs, cuts, polishes, engraves. Ideal for precision finishing. Fits your hand like a pencil—responds as easily. Weighs only 5¾ ounces. Has only one moving part—the lightweight aluminum rotor. Operates on 80 to 100 pounds of air line pressure. Takes cutting tools of any diameter up to ¼" (⅛" shank). Comes complete with Bellows Lubri-Air Filter and Lubricator, 6′ of flexible nylon reinforced air hose.

*Patent Pending

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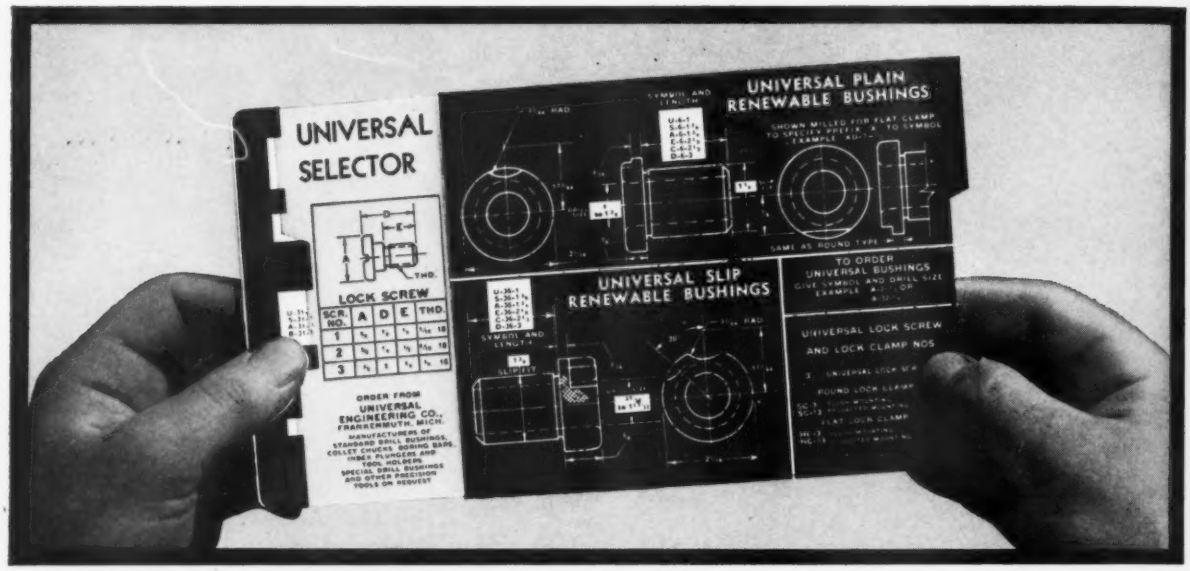
The Bellows Co.
AKRON 9, OHIO

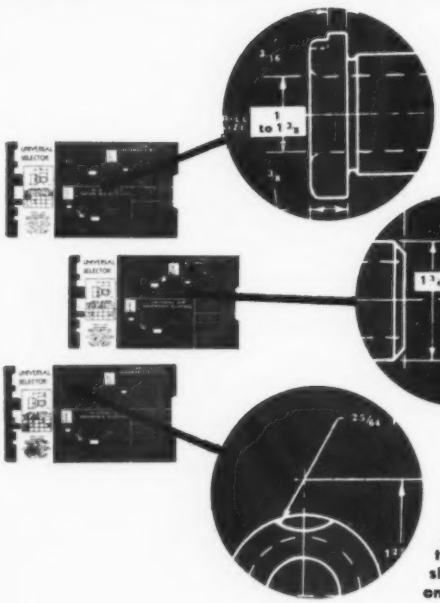
616-B

CIRCLE INFORM-A-GRAM KEY NO. 41

HOW THE UNIVERSAL DRILL BUSHING SLIDE CHART SIMPLIFIES JIG DESIGN

new plastic, pocket-size calculator gives all engineering data for the selection of all types and sizes of drill jig bushings up to 1¾" drill size





The SELECTOR is divided into four areas, one for each of the four types of bushings. The example shown here is for the plain renewable. Using this area, you move the slide until the correct drill size appears in the drill-size window.

Once the drill size is set up on the SELECTOR, all other factors now appear in the windows. This section, for example (shown actual size) shows correct bushing O.D. and dimension from center to flat for clamp.

This section shows the radius for lock screw. Every factor you need for drill bushing jig design as well as for ordering the correct bushing to fit that design is shown correctly, exactly, and at a glance on the SELECTOR.

A new service to regular users of drill jig bushings is this extremely practical plastic Selector slide-chart. When designing jigs, you will save many hours, and be certain of your accuracy, with the SELECTOR. It represents the result of six years experimentation and research by Universal Engineering Co. If you are an engineer specifying bushings and do not have one of these slide calculators—you can have one for your own design work by simply requesting it on your company letterhead. Don't wait—do it today!

193

UNIVERSAL ENGINEERING CO. FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 42

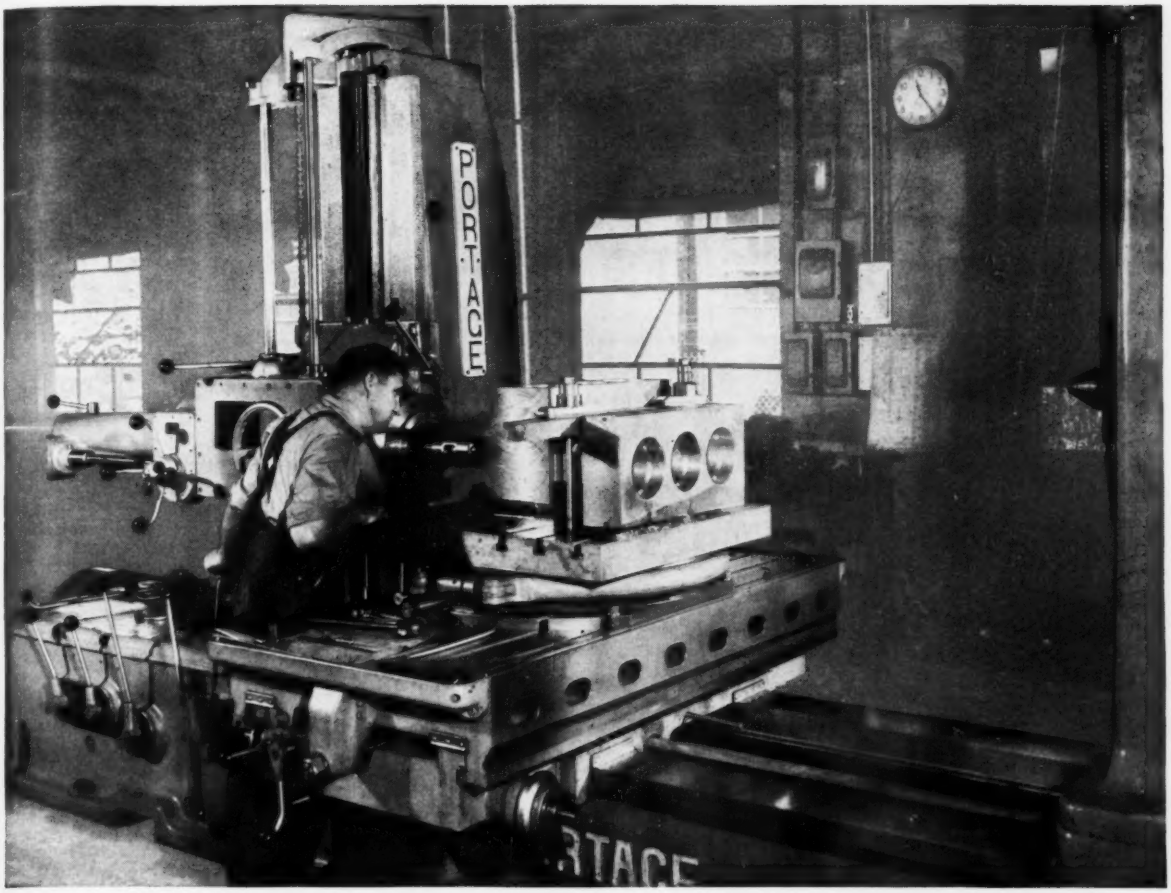
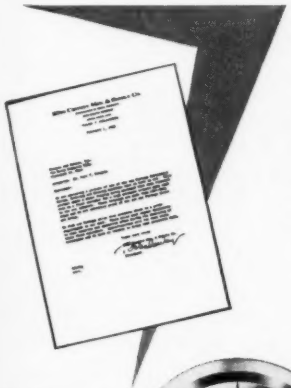


Photo courtesy 20TH Century Mfg. & Supply Co., Tulsa, Oklahoma

"We are extremely proud of the job our PORTAGE mills are doing"



The Portage Machine Co.
Akron, Ohio

Gentlemen:

Our business, as you know, is Contractors of Metal Products. This particular job is a steel forging being machined, and when finished will be a fluid cylinder for a high pressure pump used in the oil industry. These forgings are made from AISI-4140 steel and we are extremely proud of the job PORTAGE mills are doing.

We find our PORTAGE mills very accurate. These mills must repeat themselves in each location and operation often during the machining operation. Specifications call for very close tolerances and we have no trouble in doing this precision work.

Yours truly,
20TH Century Mfg. & Supply Co.

R. G. Galloway
President

THE Portage MACHINE CO.

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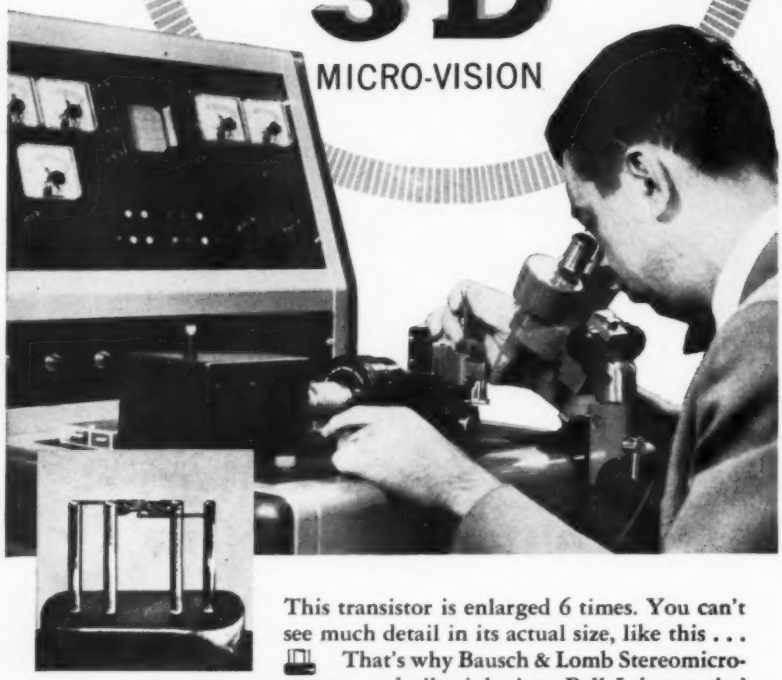
Representatives in Principal Cities

BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916

CIRCLE INFORM-A-GRAM KEY NO. 43

How BELL TELEPHONE LABORATORIES

assure precision in sub-miniature assemblies with **3-D** MICRO-VISION



This transistor is enlarged 6 times. You can't see much detail in its actual size, like this . . . That's why Bausch & Lomb Stereomicroscopes are built right into Bell Laboratories' ingenious experimental machine, "Mr. Meticulous," which automatically assembles hair-thin elements in steps involving movements of 1/20,000 of an inch! Without visual fatigue, technicians get vividly magnified views of these tiny parts and intricate operations. We're mighty proud of the part B&L Stereomicroscopes play in helping Bell Laboratories achieve miracles in electronic technology to improve telephone service.

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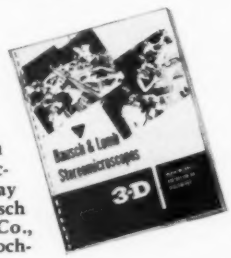
See actual stereo views! Choose exact model from industry's most complete line, with unique Selector-Chart! Write today for manual D-15. Bausch & Lomb Optical Co., 77308 St. Paul St., Rochester 2, New York.



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STEREOMICROSCOPES

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Aug. 6-17. American Society for Quality Control, U.C.L.A. Department of Engineering, University Extension. Course: "Statistical Methods in Industry." University of California, Los Angeles.

•

Aug. 7-8. National Screw Machine Products Association. Second Annual National Sales Conference. Wade Park Manor Hotel, Cleveland.

•

Aug. 21-24. West Coast Electronic Manufacturers' Association and Seventh Regional Institute of Radio Engineers. Western Electronic Show and Convention. Pan-Pacific Auditorium, Los Angeles, Calif.

•

Aug. 26-30. National Association of Furniture Manufacturers. Supply, Equipment and Fabric Fair. Conrad Hilton Hotel, Chicago.

•

Sept. 9-21. New England Chapters of the American Society for Quality Control and the University of Connecticut. Seventh Annual Statistical Quality Control Institute. The University of Connecticut, Storrs, Conn.

•

Sept. 10-12. American Society of Mechanical Engineers. Fall Meeting. Denver, Colo.

•

Sept. 10-14. New York University. Second Annual Titanium Lecture Program. NYU College of Engineering, New York.

•

Sept. 10-15. Investment Casting Institute. Intensive Course in Investment Casting. University of Michigan, Ann Arbor, Mich.

•

Sept. 17-21. Instrument Society of America. Eleventh Annual Instrument-Automation Conference and Exhibit. New York Coliseum, New York.

•

Sept. 24-25. Steel Founders' Society of America. Fall Meeting. The Homestead, Hot Springs, Va.

•

Sept. 25-28. Association of Iron and Steel Engineers. Iron and Steel Exhibition and Convention. Public Auditorium, Cleveland.

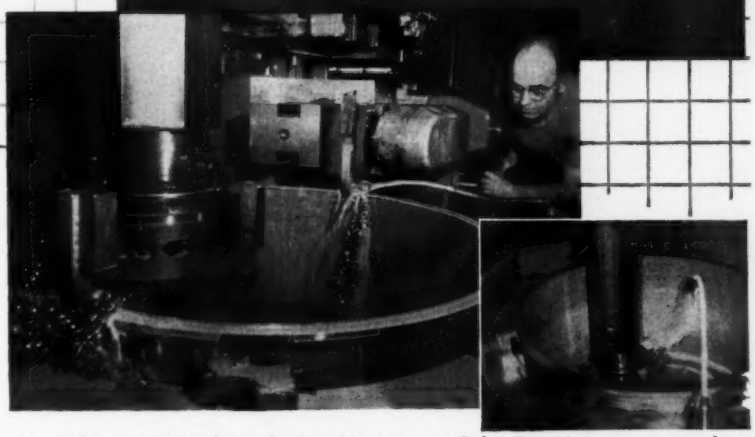
CIRCLE INFORM-A-GRAM KEY NO. 44

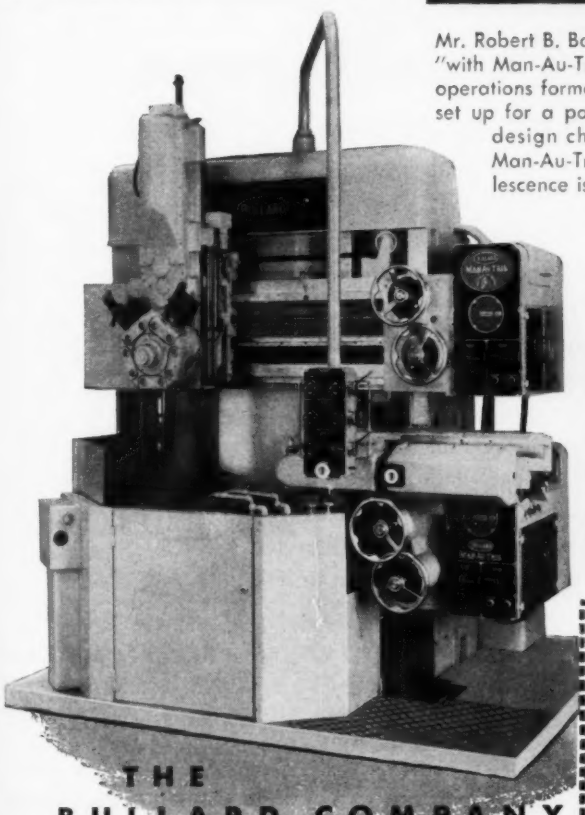
PRODUCTION "at all time Peak"

with BULLARD

MAN-AU-TROL VERTICAL TURRET LATHE MODEL 75

Solar Aircraft Company of Des Moines, Iowa and San Diego, California, has found the versatility and flexibility of the Bullard Man-Au-Trol V.T.L., Model 75 a distinct advantage in the machining and fabricating of various jet aircraft engine parts and assemblies.





Mr. Robert B. Ballard, Production Manager at Solar-Des Moines, reports that "with Man-Au-Trol, Model 75, it is possible to do a multitude of machining operations formerly requiring numerous expensive machines which had to be set up for a particular operation, so limited in scope, that an engineering design change either obsoleted the tooling or the machine. With Man-Au-Trol, Model 75, because of its wide range of functions, this obsolescence is greatly reduced — if there is a design change, only a new set-up is made — not the purchase of a new multi-thousand dollar piece of machinery."

These same advantages can be applied to your manufacturing methods —
Ask your Bullard Sales Engineer for complete details.

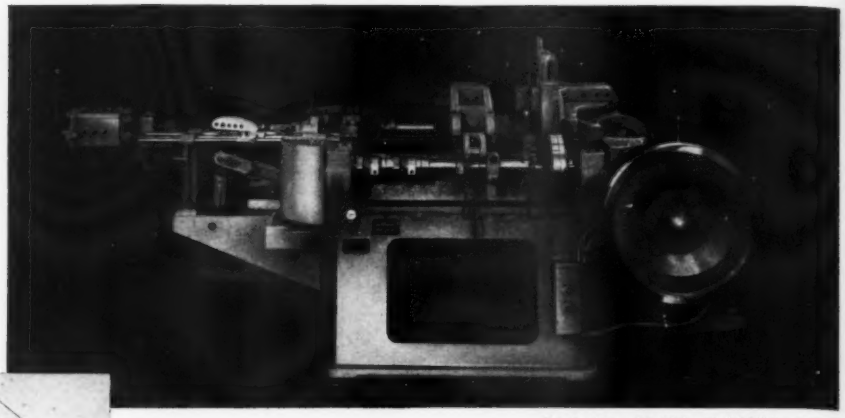
THE BULLARD COMPANY
BRIDGEPORT 9, CONNECTICUT

THE BULLARD COMPANY
286 CANFIELD AVENUE • BRIDGEPORT 9, CONNECTICUT

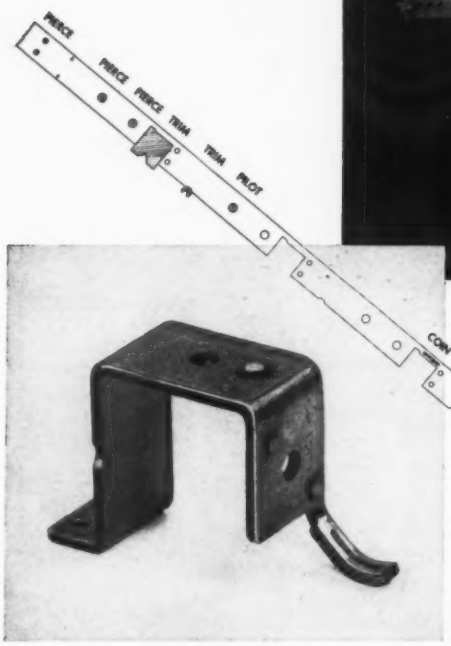
Please send me a copy of the
NEW MAN-AU-TROL V.T.L., MODEL 75 CATALOG

NAME.....
COMPANY.....POSITION.....
ADDRESS.....
CITY.....ZONE.....STATE.....

CIRCLE INFORM-A-GRAM KEY NO. 45

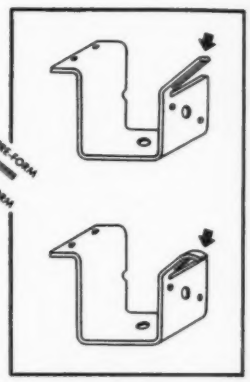


Basic No. 33 U.S. Multi-Slide Machine used to produce (with appropriate tooling) the automotive component illustrated.



The drawing at the left shows the sequence of operations performed in the U.S. Multi-Slide to produce an automotive component complete in the U.S. Multi-Slide.

View of the completed part.



A two level forming position is used to produce the automotive component. The top view shows the pre-form obtained in the upper level and the lower view shows the finished form obtained in the second or lower level forming position.

MULTIPLE OPERATIONS ON U. S. MULTI-SLIDES® MULTIPLY PROFITS

Each secondary operation eliminated means reduced piece part costs. You, like all other manufacturers, are striving to attain this end result. In the production of formed metal stampings from coil stock, the U.S. Multi-Slide may be the answer.

U.S. Multi-Slides are designed primarily for the automatic production of precision formed stampings from coil stock. Many different types of stampings ordinarily requiring secondary handlings can be produced complete on the Multi-Slide.

The part illustrated on these pages is a component for an automotive manufacturer and is produced complete without secondary handlings. The sequence of operations is pierce, trim, coin, extrude, cut off and form (2 levels). This automotive component is just one of many different types of stampings which can be produced complete on the U.S. Multi-Slide.

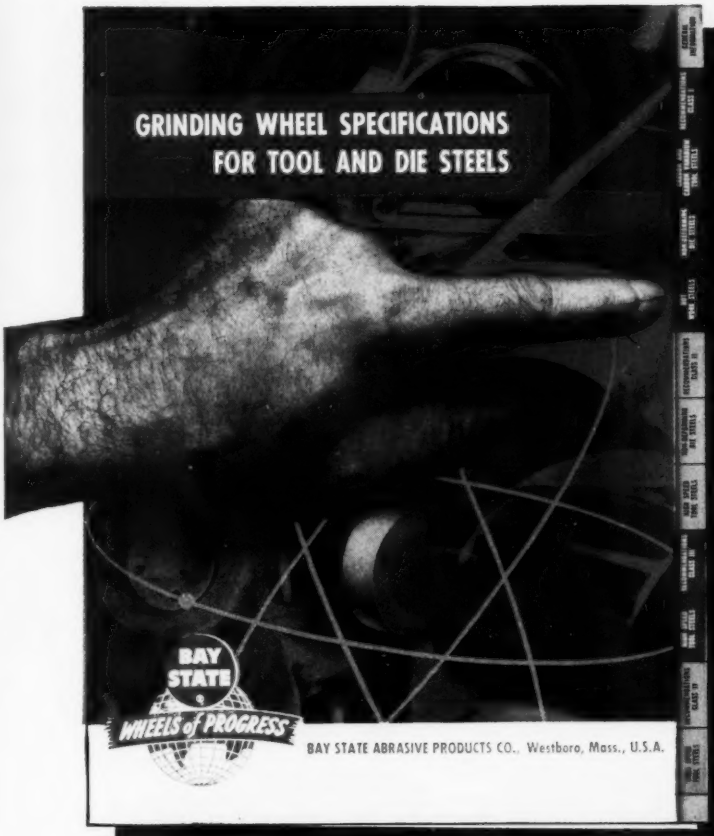
If stampings are included in your production program, ask for a copy of Bulletin 15-P illustrating and describing the four sizes of U. S. Multi-Slides we now build.

U. S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers
U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

CIRCLE INFORM-A-GRAM KEY NO. 46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FLASH/CHANGE® the ultimate in QUICK CHANGE TOOLING

For General Purpose Work and Production Applications . . .

- A comprehensive range of Standard Microbore Flash-Change boring and milling equipment is available for tool work and general purpose machining.
- A complete service is available for engineering and manufacturing special Microbore Flash-Change equipment for all types of production operations.

Write for illustrated Flash-Change Catalog

DEVLIEG MICROBORE® DIVISION OF DEVLIEG MACHINE COMPANY

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... make tracks

TO YOUR

Threadwell

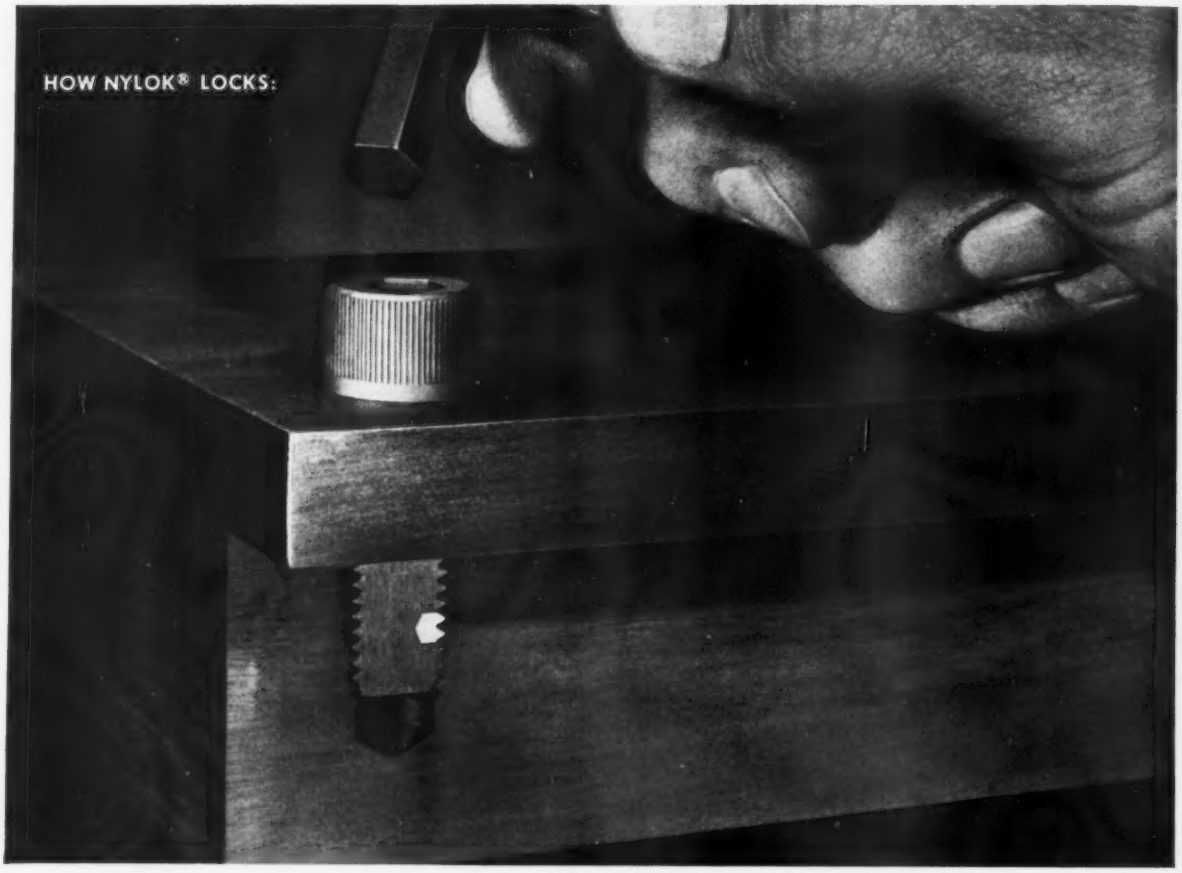
DISTRIBUTOR

FOR THE FINEST IN
CUTTING TOOLS AND GAGES

Made by THREADWELL, Greenfield, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 49

NEW—a complete line of socket screw products



LOCKED! The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together, and locks the screw securely.

BEFORE ASSEMBLY. The nylon pellet projects slightly beyond male threads. When assembled, female threads will be impressed into it. Pellet locks effectively whether the screw is seated or not.

AFTER REMOVAL. "Plastic memory" of pellet has expanded impressed threads to greater diameter than screw threads. Screw can be used repeatedly. In use, "memory" keeps threads tightly locked.

self-locking UNBRAKO that won't work loose

They simplify design and save production time

UNBRAKO socket screws are now available embodying the Nylok* self-locking principle. Nylok provides a truly practical new solution to the problem of making screws self-locking.

An UNBRAKO screw with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Just thread the UNBRAKO into any tapped hole. *Seated or not*, it locks positively wherever wrenching stops. The tough, resilient nylon pellet forces mating threads together and holds tight. The screw will not shake loose.

You save production time when you build products with self-locking UNBRAKOS. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lockwashers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. So are cotter pins and complex multiple set screw installations.

Self-locking UNBRAKOS are completely reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from —70° to 250°F. And, on properly seated screws, the pellet acts as a liquid seal.

Self-locking UNBRAKO socket screws come in a complete range of standard sizes and materials. See your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 36, Pa.

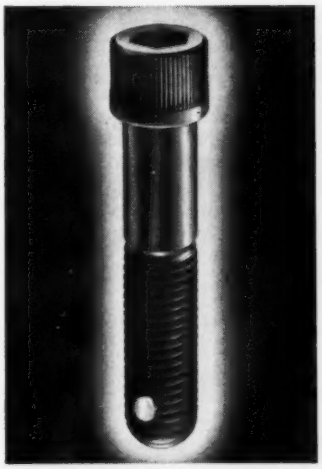
**T.M. Reg. U.S. Pat. Off., The Nylok Corporation*

UNBRAKO SOCKET SCREW DIVISION

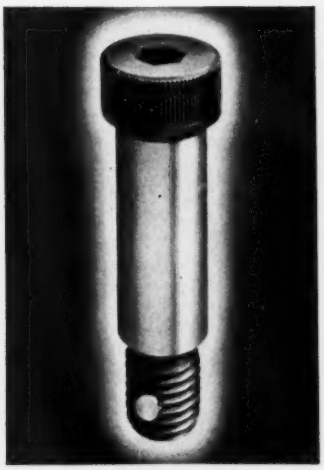
STANDARD PRESSED STEEL CO.

SPS

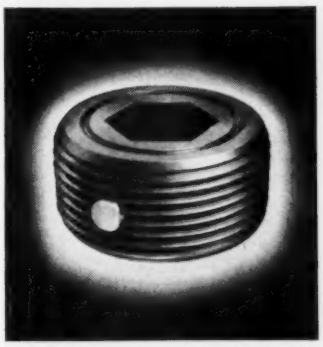
JENKINTOWN PENNSYLVANIA



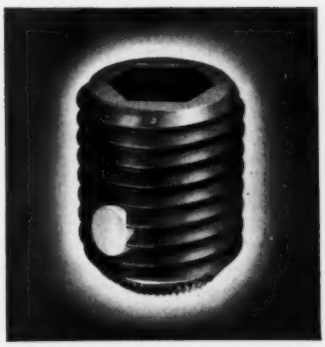
Socket head cap screws. Standard sizes # 6 to 1 in.



Socket shoulder screws. Standard sizes ¼ to ¾ in.

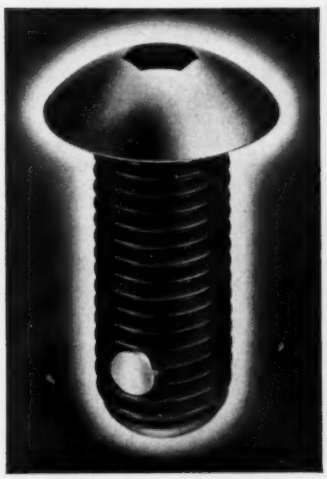


Socket pressure plugs. Standard sizes ⅛ to 1¼ in.



Socket set screws. All standard point types. Standard sizes # 6 to 1 in.

Flat head socket screws. Standard sizes # 6 to ¾ in.



Button head socket screws. Standard sizes # 6 to ⅜ in.

CIRCLE INFORM-A-GRAM KEY NO. 51

MANUFACTURING MEMOS

Aluminum Standards

● The Sheet Division of The Aluminum Association is adopting American Standard Association's preferred thicknesses for uncoated thin flat metals. This applies to standard mill sizes of all aluminum sheet alloys which are sold in large volume through warehouses. The new standards went into effect on July 1. The month of May set an all-time record for primary aluminum production in the United States, with 301,600,064 pounds.

Men — Offices and Awards

● Andrew A. Daly is the new president of the American Society of Training Directors. He is project manager for International Business Machines Corp.

● D. T. Wellman, president of Wellman Bronze and Aluminum Co., was recently re-elected president of the Magnesium Association.

● Jon W. Hauser received a 1956 award from the Industrial Designers' Institute for his design of Model HH Payloader. This self-propelled tractor-shovel is manufactured by Frank G. Hough Co.

Research and Development

● An advanced electronic research and development center has been opened in San Diego by Marvelco Electronics Division of National Aircraft Corp. The staff will work with electronics systems including telemetering, data-handling and display, guidance-navigation and computer research and development.

● Bowser-Morner Testing Laboratories has established a research and development department. It will provide small and medium industrial concerns in the Dayton area with a complete service for the development of new products or the improvement of established designs. G. L. Deniston will head the new department, which will coordinate all phases of the engineering facilities available at the company.

● The U. S. jet aircraft now under development and ready for delivery by 1959 and 1960, will be equipped with sound suppressors which should bring noise within the sound limits now produced by propellor-driven aircraft. The announcement on the progress in controlling jet sound was made by leading American and British authorities on jet aircraft sound.

Pivot Punch and Die Corp. has announced a 48-hr. delivery on any size of punch in a new line of cylindrically ground punches. Point diameters of 1/32" to 1" in fractional and decimal increments are available.

The Fastcut cutting tool line formerly produced by Fastcut Division of Hilton Mfg. Co., is now being manufactured by the newly organized Fastcut Tool Co. Headed by Earl W. Bathey, the Detroit company is producing Woodruff keyseat cutters, combined drills and countersinks, center reamers and special tools.

F. J. Stokes Machine Co. changed its name to F. J. Stokes Corp. on July 1. The firm is known for a line of production and processing equipment.

Crowningshield-Harris Co., Inc., manufacturer of milling machines in Greenfield, Mass., for 50 years, has been bought by a new corporation. The corporation with Francis J. Sweeney as president and Daniel J. Sweeney, sales manager, makes a line of toolroom and production milling machines, both horizontal and vertical.

A Pacific Division of Farnsworth Electronics Co. has been formed following the acquisition of Bennett Products Mfg. Co., Palo Alto, Calif. The announcement was made by Dr. Harvard L. Hull, president of Farnsworth, which is a division of International Telephone and Telegraph Corp. The newly created division will produce glass-on-metal hermetic seals, insulators, hermetically sealed switches and connectors used in electronics. Vinton D. Carver has been elected vice president and general manager of the Pacific Division.

Hydraulic Press Mfg. Co. of Mt. Gilead, O., has been merged with a Milwaukee firm, Koehring Co. Hydraulic Press which manufactures metalworking presses, plastic injection molding and die casting machines, hydraulic components and metal baling and steeping presses, will be operated as a Koehring division.

Detroit Broach Co., Inc. has changed its name to Detroit Broach & Machine Co.

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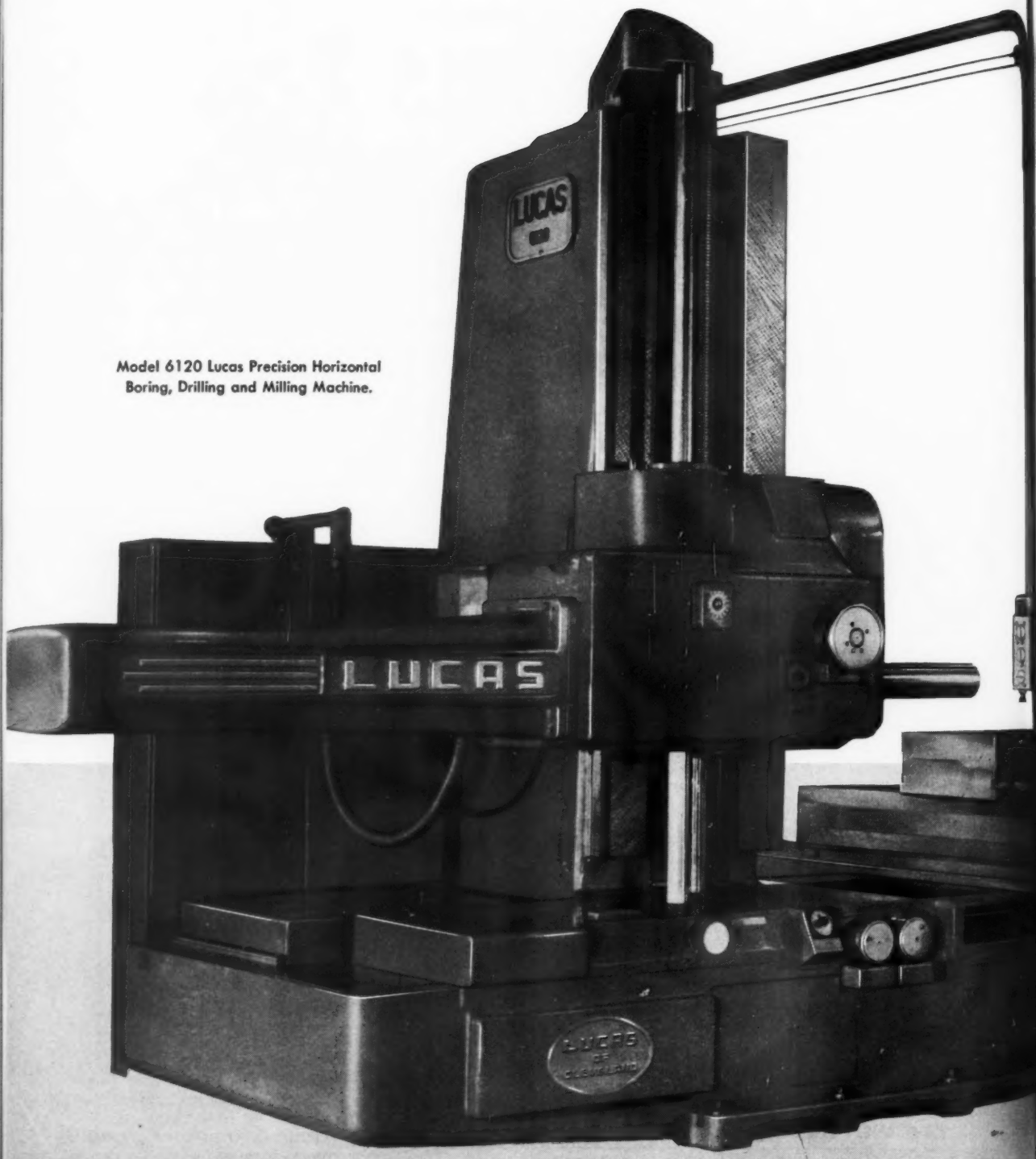

Model 6120 Lucas Precision Horizontal
Boring, Drilling and Milling Machine.

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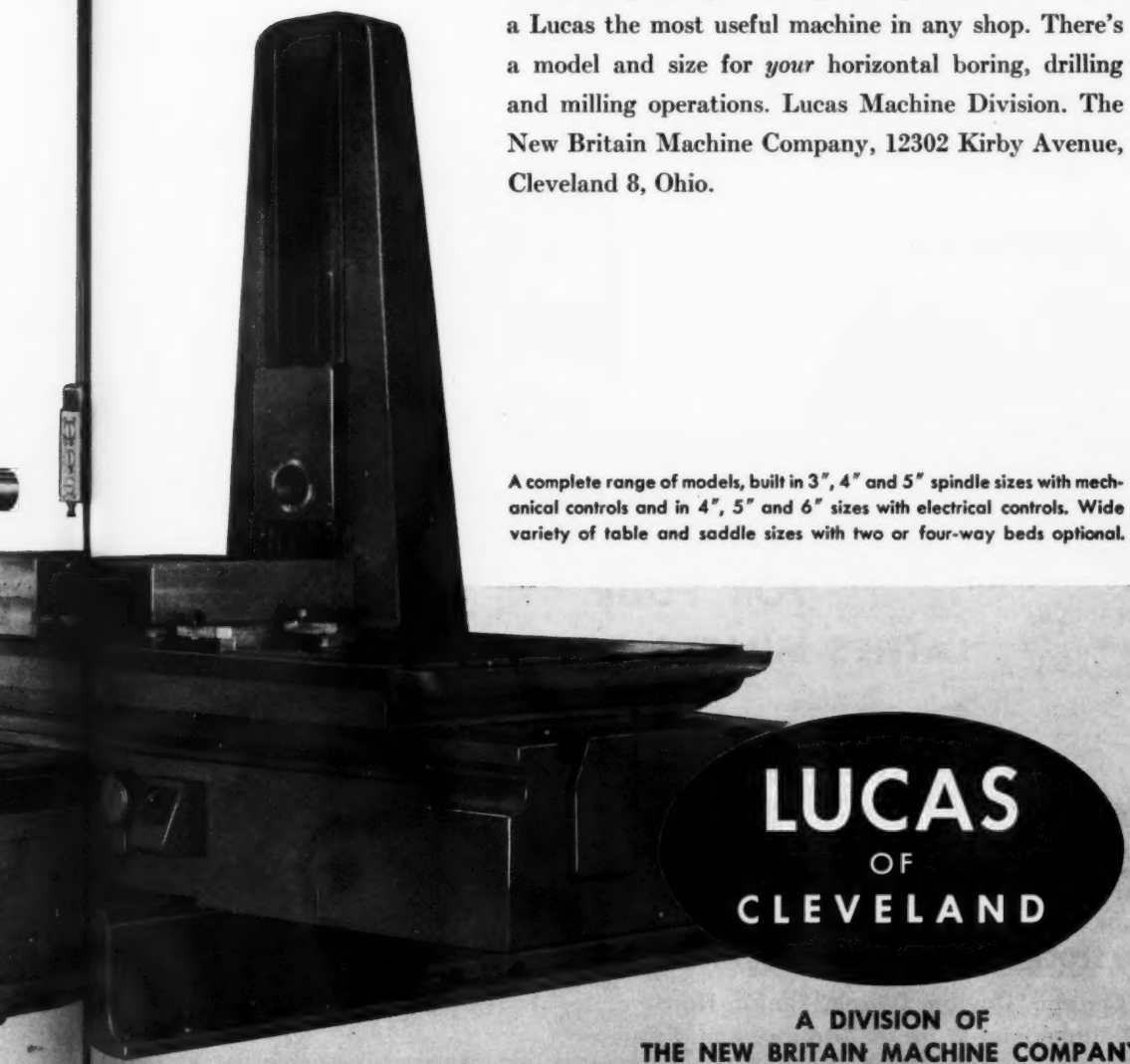

A complete range of models, built in 3″, 4″ and 5″ spindle sizes with mechanical controls and in 4″, 5″ and 6″ sizes with electrical controls. Wide variety of table and saddle sizes with two or four-way beds optional.

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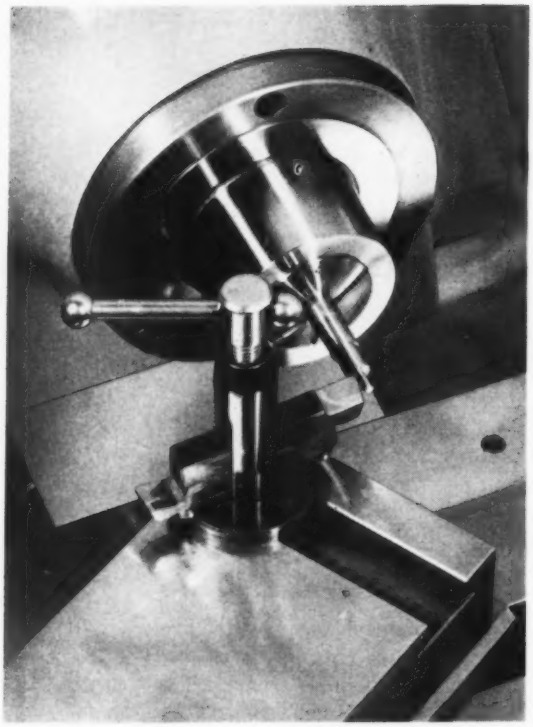

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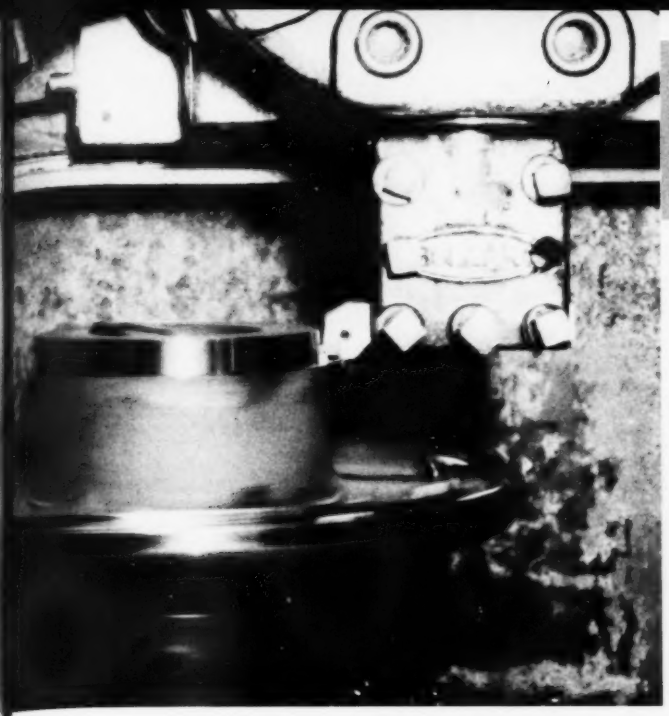


carbide NEWS

WESSON Multicuts send tool costs tumbling from 42 cents to 1 cent per piece

Tools Developed for High Output Pay Off on Low Volume Jobs

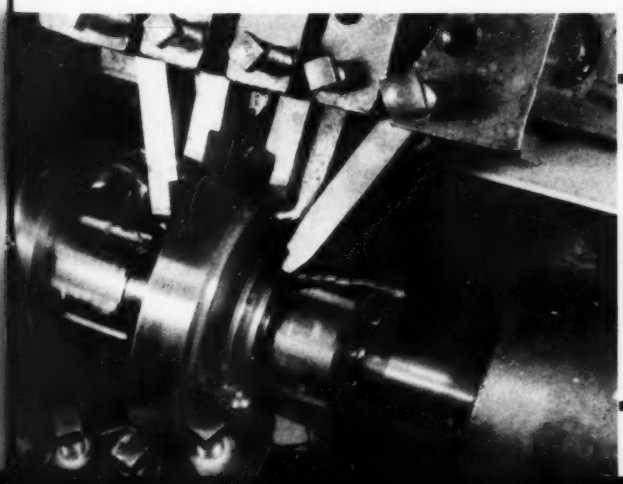
Sharply reduced tool costs and a 30 percent increase in production were the direct results of changing from conventional tooling to indexible insert carbide tooling at the plant of a mobile materials handling equipment builder. Thus the application of tools developed originally for volume production also paid off in producing parts at a relatively low output rate.

The job consisted of machining a cast steel hoist drum on a Bullard at a rate of 1.27 pieces per hour. The former tool cost of 47 cents per piece for facing and turning the flange, rough facing and turning the drum hub and finish facing and turning the hub was slashed to 1 cent as the result of a change to Wesson Multicut holders and Wessonmetal indexible carbide inserts.

Most of the former high tool cost was due to the fact that only 4 pieces per grind were obtained in machining the flange and roughing the hub. Currently the Wessonmetal WM inserts turn out 80 pieces per grind. Similarly the number of pieces in finishing the drum hub has gone up from 10 pieces per grind with the brazed tool formerly used to 120 pieces per grind with Wessonmetal WH.

Additional savings result from an 85 per cent reduction in down time for each tool change with the end result being a 30 per cent improvement in output.

Special note should be taken of the fact that these savings were achieved without resorting to special carbide grades. Both Wessonmetal WM and WH are strictly standard.

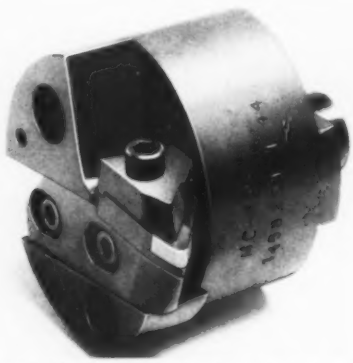


Here's a case where "equivalent" carbides, at least in the "Classification Code", gave considerably different performances. The job is rough and finish turning multiple diameters of 4021 steel forgings in an eastern gear plant. Tool life jumped from 180 to 750 pieces per grind when Wessonmetal WH (a C-7 grade) replaced the C-7 grade previously used. Tool costs dropped from 2 cents per piece to half a mill and production increased because of lower down time. The reason? Grade WH effectively resisted cratering where the other hadn't.

Boring Tool Features Throw-Away Insert

Among the increasing number of boring cutters developed by Wesson to take advantage of the throw-away insert concept is a special cutter now being used to form an internal spherical radius on an automotive differential case to close tolerances.

As in most throw-away insert boring tool designs pioneered by Wesson, a number of exacting requirements had to be met before the design was accepted and the tool placed in service. Aside from the savings in setup time and the elimination of carbide grinding, the throw-away boring tool is holding extremely close limits on the radius to within plus .001-inch. Even closer tolerances are necessarily held on the insert and holder itself.



Special boring cutter developed by Wesson forms internal spherical radius on automotive differential case.

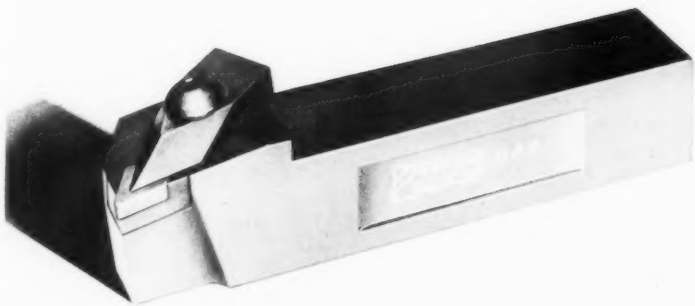
Oscillating Tool Grinder Described in Bulletin

New "Poweramic" oscillating tool grinder is described in a 6-page, 3-color bulletin just released by Wesson. Designed for offhand grinding of standard and special single point carbide tools, the grinder takes the skill and effort out of grinding carbides, boosts output and gives finer finishes.

The oscillating wheel moves through a true arc at 150 strokes per minute, tool being held in a fixed position. Faster metal removal, hone-like (double cross-hatch) finishes and elimination of manual lateral tool movement are among features illustrated and described.

For full details on the Poweramic grinder write Wesson for Bulletin 56-A.

New Holders Use Diamond Shaped Throw-Away Inserts



Above is the MX-8-T5C holder specially designed for production copy turning lathes. Below is the right hand (DAR) model for plunge turning and facing.

Three new holders for throw-away inserts have been added to the Wesson Multicut line. All three tools use Wesson standard diamond shaped D-55 throw-away inserts. The holders, designated as semi-standard, mount the insert right hand (DAR), left hand (DAL) and centrally (MX-8-T5C).

All features, including method of locking and clamping, use of adjustable chip breaker clamp, anvil relieved for built-up edge, etc. are similar to those in the standard line of Multicut holders.

DAR and DAL holders are particularly suitable for plunge turning and facing operations. The MX-8 type is designed for use on various production copy lathes and, on machines of this type, frequently eliminates subsequent finish turning or grinding operations.

Each insert used in any of the three holders in this series has four cutting edges. It is indexed progressively and discarded after all edges are used up.

For additional details on these holders ask for Bulletins DAR-DAL and MX-8.

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"Commendable Comments"

". . . it is not enough that a company should merely make a profit. It must make an adequate profit if the Working Man's security is to be protected. And that, of course, is what every well-managed company is trying to do."

—By Roger M. Blough, Chairman of the Board, United States Steel Corporation, at the Spring Meeting of The Investment Bankers Association of America.

"American design engineers, in contrast with their European competitors, tend to restrain those design features that adversely affect cost if the quality gained thereby is small. This is not due to different engineering teaching in America and Europe, but to the American habit of measuring everything in terms of money. The result of this sort of design is a tremendous overall saving in labor and cost."

—William A. Hadley, director of the Research and Engineering Division of Mergenthaler Linotype Company, at the ASME Semi-Annual Meeting.

"Ceramic coatings will be a key material in the coming nuclear and supersonic era."

—By Robert A. Weaver, Jr., President of the Bettinger Corporation, at a meeting of the National Federation of Financial Analysts Societies.

"Management should be very, very careful not to assume that automation did so and so to this plant; therefore, automation will do this same thing to us."

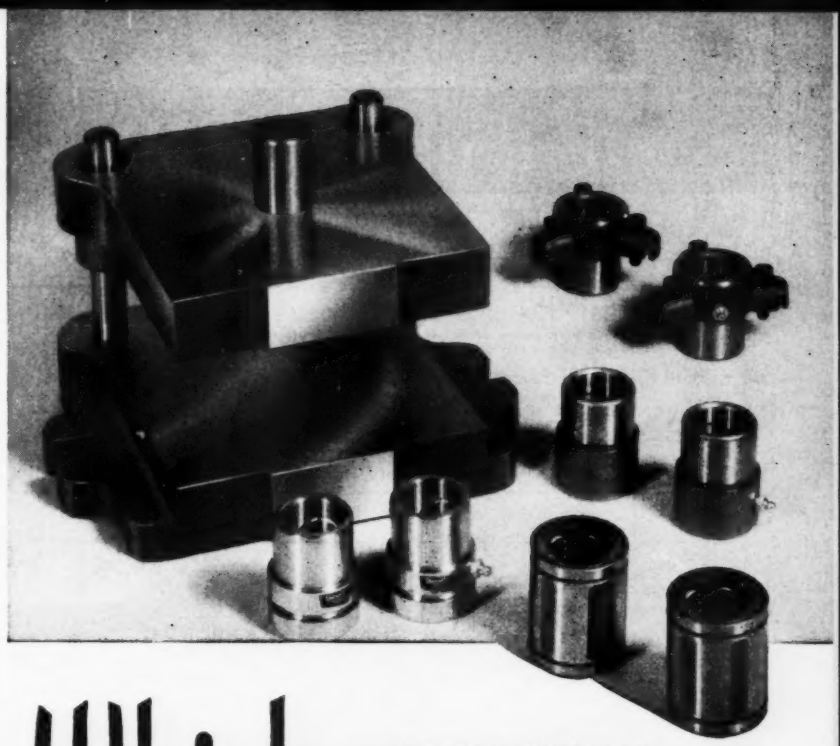
—A comment by James R. Bright, Lecturer on Industrial Management, Graduate School of Business Administration, Harvard University, at the American Material Handling Society's Technical Sessions.

"A society geared to constant technological progress is compelled, in order to remain viable, continually to lift the levels of well being of its members. More goods and the earning power to acquire them, more leisure for the development of the arts, better communications, better health — these are the very conditions of its survival. These evolutionary processes will probably accelerate during your lifetime."

—Louis L. Strauss, Chairman, U.S. Atomic Energy Commission, at Carnegie Institute of Technology's Commencement Exercises.

"In spite of a good deal of talk of contraction and worry about where our economy is going, 1956 promises to be our best year in history in terms of production, employment and earnings."

—Dr. Emerson P. Schmidt, Director, Economic Research Department, Chamber of Commerce of the U.S., at the recent Mid-Year Business Forecast Symposium.



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To aid you in bushing selection, we've prepared a bulletin on the subject. Just ask for Bulletin 56, and we'll send your personal copy without delay. Detroit Die Set representatives also will be glad to personally aid you in selecting the right bushings and die sets. They're as near as your 'phone.

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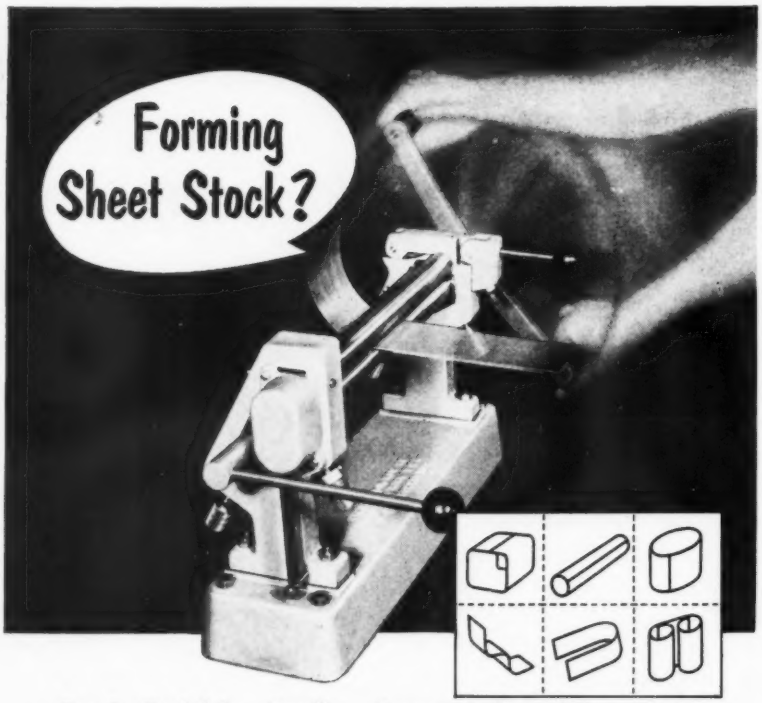
Need help in any aspect of modern metalworking? See this section for materials and design aids, inspection and production techniques.

PUBLICATION PREVIEWS 116
Capsule description of current literature. Bulletins, brochures, catalogues and circulars — You name it.

PROGRESS ON PARADE 148
Check this carefully. It can bring new efficiency to your operation. The newest in machines, tools, and accessories.



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CIRCLE INFORM-A-GRAM KEY NO. 60

EDITORIAL: Stampings, Unlimited . 63

— FEATURES —

COST CONTROL: "Buying to keep Costs Down" by H. Thomas Hollowell Jr., Standard Pressed Steel Co. 8

Converting specially designed items to standardized parts is often possible and is a feasible way to keep buying costs down. Mr. Hollowell points out how savings can be made by buying standardized parts from the supplier.

TRAINING: "Industry's Training Dollar" by Dr. Erwin K. Taylor, Industrial Psychologist 34

Dr. Taylor raises some interesting questions when he delves into what Industry is spending for supervisory training and then what the returns are in terms of improved on-the-job performance of trainees.

COST REDUCTION: "Establishing A Cost Reduction Program" by George H. Logan, Consultant Engineer 64

The establishment of a well organized reduction program is a sign of progressive management. Mr. Logan outlines a practical framework upon which to build such a program.

STANDARD COMPONENTS: "Use Standard Components for Special Machine Tools" by Watson N. Nordquist, Managing Editor 69

There is a definite trend throughout Industry to incorporate as many standard machine components as possible in the building of special purpose machines. The advantages of this trend are shown by Mr. Nordquist in relating the activity of one machine tool builder.

MANUFACTURING COSTS: "Analysis: Manufacturing Costs Relative to Product Design" by Lad J. Bayer, The Warner & Swasey Company 73

Improvements in product quality often result in increased cost, and conversely lower costs often result in lesser quality. In studying this problem, Warner & Swasey has developed a series of cost behavior charts which are analyzed by Mr. Bayer.

Editorial Index

AUTOMATED THREADING: "Modernization for Automated Threading" 77

A striking example of automation applied to industry, other than automotive, is found in the threading of oil well casings in sizes up to 13⅜" OD. Five machines, each having two threading heads, are attended by one operator whose work is mostly inspection.

AIR POWER: "Channeling Air — Valves and their Use in the Control of Pneumatic Equipment" by William E. Hoffman, Associate Editor 78

Channeling air efficiently to its point of use is most important in plant operation. Mr. Hoffman discusses the application of several types of air control valves and what they will accomplish.

CHUCKERS: "Automatic Chuckers Expedite Multiple Cuts on Bearing Caps." 82

A case history — illustrating the efficient use of two Warner & Swasey chuckers performing a job of finish boring three step bores, facing a large flange, and turning the OD of cast iron bearing caps.

NUMERICAL CONTROL: "Some Basic Aspects of Numerical Machine Tool Control" by L. W. Herchenroeder, Westinghouse Electric Corporation . 83

The benefits to be obtained by external programming the operations of an automatic machine on cards or tape have excited considerable interest. For a better understanding of the principles involved, Mr. Herchenroeder discusses the fundamentals of the numerical control system.

BLAST CLEANING: "Low Pressure Straight-Thru Cleaning for Castings" 88

Desirable advantages are found in a low pressure blast system designed for cleaning sand off of castings. In its use; little or no parent metal is removed; no surface pitting occurs; and no warping or distortion takes place.

BARREL FINISHING: "Automated Barrel Finishing" 92

A programming feature applied to an automated barrel type finishing machine makes possible such operations as descaling, degreasing, grinding, deburring, burnishing, rinsing and rust inhibiting in an automatic sequence.

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It's easy to select the *right* tool for counterboring, countersinking and spot-facing with Continental Counterbore Sets! Save time and keep your tools in one handy place with any one of these three popular sets:

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A TWIST OF THE WRIST!
Continental counterbore driving members are designed so that the cutter can be disengaged from the holder with a *simple hand quarter-turn*, even after heaviest cuts.

56-15

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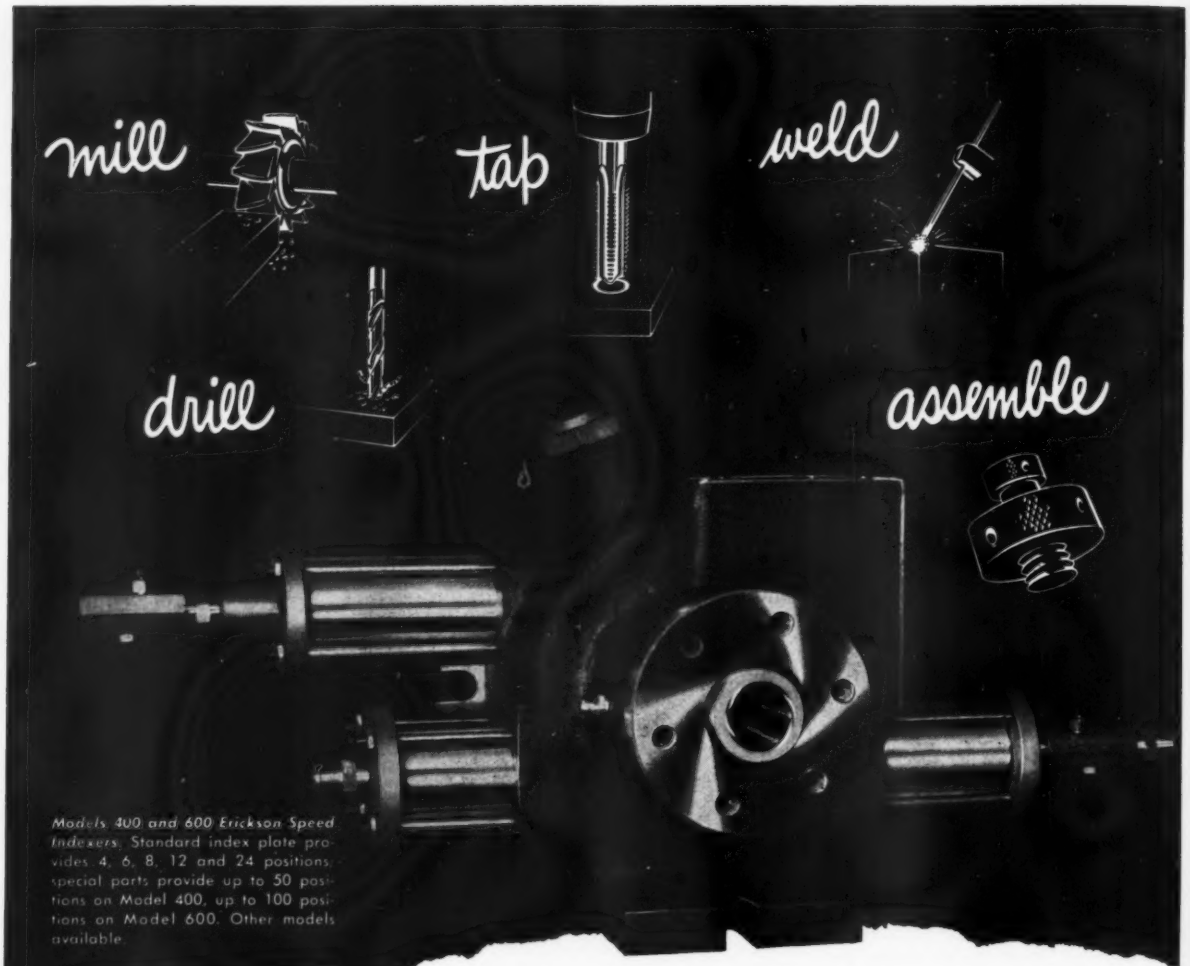

Models 400 and 600 Erickson Speed Indexers. Standard index plate provides 4, 6, 8, 12 and 24 positions; special parts provide up to 50 positions on Model 400, up to 100 positions on Model 600. Other models available.

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That's where Erickson Indexers really pay off. For you can interlock them into your production set-up with micro switches and solenoid valves. The hardened and ground lock pin operates in conjunction with the actuating mechanism to assure *positive positioning and angular accuracy within 2 minutes of a degree.* (Repetitive accuracy is no indication of angular accuracy. Erickson holds repetitive accuracy in low "tenths" of a thousandth.) And Erickson Indexers can maintain this great accuracy because their adjustable, self-contained shock control unit delivers a cushioned rotary load to the mechanism, thereby reducing wear.

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CIRCLE INFORM-A-GRAM KEY NO. 62

editorial:

Stampings, Unlimited

THE BETTER THE PICTURE one gets of the metal stampings industry, the greater the resultant appreciation of the magnitude of that industry.

We dare suppose that even those who work and live in the world of stampings sometimes can be caught in the position of not being able to see the forest because of the trees.

Wherever you look you are bound to be confronted with a profusion of examples of the art of cutting and forming flat metal sheet or strip into useful objects, from the gadgets on your desk to the body of your car.

A more tangible measure of the diversity of the uses of stampings recently came from the Pressed Metal Institute. This organization, which includes leading contract stamping plants from across the country, publishes a directory of members' facilities from maximum press sizes to the various finishing and assembly operations which can be performed.

The availability of the directory to Industry has been publicized throughout editorial channels. One lot of nearly 800 requests for the directory was analyzed in terms of the Standard Industrial Classification of metalworking categories making up the origins of the inquiries.

It was found that 32 categories were represented. These ranged from "Instruments and Related Products," through "Heating and Plumbing Equipment," "Costume Jewelry and Notions," to "Construction and Mining Machinery" and "Communications Equipment."

In other words, you name it, and the chances are, overwhelmingly, that metal stampings are involved.

The S.I.C. information cited came out of a sales conference conducted by and for member contract stamping plants of the Pressed Metal Institute. The conference, late in June, covering markets, quoting and purchasing procedures, standards, publicity and advertising, was such a success that it was decided to make it an annual affair. It included short and long range planning in line with the increasing importance of the contract stamping plant as a supplier to Industry.

Most contract stamping plants are in the governmental classification of small business. As the industry maintains its healthy growth many of the "smalls" are destined to become bigger and bigger. Back-stopping these transitions will be more exhaustive market analyses and stepped-up sales and advertising efforts by the more progressive and aggressive operators.

As all measures of the country's economic growth — population, gross national product, employment, capital goods expenditures — ring up increasing totals, there will be a paralleling increase in the demand for and production of metal stampings. More people to want things, more people able to buy things, expanded facilities for turning out things at lower unit costs, all augur well for the stampings industry.

It is both in recognition and furtherance of this that TOOLING & PRODUCTION has presented each year for nine years, an annual PRESS DIES & STAMPINGS Feature Issue. In our 10th Annual, destined for October, you will find such a wealth of material as, "Methods-Time-Measurement as Applied to Punch Press Operations," "Forces in Brake Forming," "Reduced Costs in Setting Press Tools," and "How to Achieve Positive Stock Retention in Bending Dies," to mention a few.

Stampings range from the simple to the complex, as does the press tooling that produces them — by the hundreds or millions. Stampings have to justify their economic existence cost-wise and performance-wise in tight competition with forgings, machined pieces, die castings and other forms of metalworked components.

The stamping industry is dynamic. It has to be, in order to meet the challenges that new metals and processes are constantly presenting to parts and assembly builders.

The contract stamper is in the vanguard of metalworking progress and evolution. His extensive store of pressworking know-how is attained by being exposed to and solving problems for users of stampings from all cross-sections of Industry

E. Willard Pennington

August, 1956 editor

Two-Man Team Concept

KEY to

ESTABLISHING A COST REDUCTION PROGRAM

by George H. Logan
Consultant Engineer
Los Angeles, California

THE PRIMARY OBJECTIVE of any manufacturing enterprise is to make money. As the company grows, necessary duties become definite responsibilities of the various key individuals. Everyone has the responsibility of keeping costs down, but this responsibility often becomes subordinate to other, more pressing, needs. Saving money is not always compatible with the primary objective of making money.

Manufacturing concerns need a practical framework upon which to build a permanent Cost Reduction Program. Usually the large industrial organization is well covered in this direction; it may have a well established industrial engineering staff including value analysts, quality engineers, motion-study specialists, and others. But the small to medium size concern often lacks a definitive approach to the subject of continuing Cost Reduction.

A very fine way to establish an operational economy program is to retain a good consultant and permit him to use modern analytical tools such as Methods-Time Measurement. Often Management, for valid reasons, prefers to undertake this work with its own staff.

A Cost Reduction Program should be conducted on an organized rather than a haphazard basis. An excellent springboard is the formation of a Two-Man Cost Reduction Team in each major department. In very small plants, one Team may serve the entire plant. The men chosen should be the alert, inquisitive, imaginative type. Each Team should serve for six months, then a new Team appointed to insure fresh ideas. Before starting this work the Teams should be briefed by Management as to the philosophy and objectives of the program. Among other points, the briefing should definitely include indoctrination respecting these facts:

- The power of a company to compete in its field is inversely proportional to its costs.
- Job security and opportunities for advancement, plant-wide, are increased through Cost Reduction.

The briefing could well include such graphic examples as the following: In typical situations a company will net roughly $5 on each $100 of Sales; so wherever costs can be cut by $5, the benefit is essentially equivalent to having sold an extra $100 worth of goods or services.

Committee Guides Team Effort

A permanent Cost Reduction Committee should be established in conjunction with the creation of the Two-Man Teams. In the medium to small concerns here contemplated, the

Committee members should be section heads. For large companies, the members undoubtedly would be a notch or two below the section head level. The Committee's purpose is to provide guidance, screening, evaluation, and action.

The Committee should be empowered to install any Cost Reduction step approved by itself when the step will require an expenditure less than some arbitrary figure. Beyond this figure, recommendations are forwarded by the Committee to Top Management for authorization or rejection. The Committee should meet at regular intervals; twice per month is a good spacing. An outline of the Committee's main functions would be:

- Review all proposals for Cost Reduction; reject, return to the originator for further study or clarification, or approve proposals, as may be appropriate.
- Recommend avenues for investigation to the Two-Man Teams.
- Collaborate with the accounting department on cost studies of particular operations.
- Publicize good results obtained from the program.

Thus, proposals generated by the Two-Man Teams are submitted to the Cost Reduction Committee for study and action. Cost Reduction recommendations originating independently of the Teams are also considered by the Committee. The important thing accomplished by this organizational setup is that Cost Reduction is specifically made **somebody's** business . . . not merely **everybody's** and thus **nobody's** business.

Even in many large plants, the Committee and Two-Man Team concept may provide the means for plugging the gaps — for studying those operations and practices that are considered safe, that never cause any trouble. Study of such operations and practices often results in surprising and substantial savings.

The Teams are provided with copies of a very simple form called "Cost Reduction Proposal." On this form are simply four captions: Item, Description, Drain Reasons, and Alternatives.

The writing entered under the captions **Item** and **Description** will orient a discrete proposal. Under the caption **Drain Reasons** is written why it is believed that the **Item** is costing too much. Under the caption **Alternatives** the Team defines one or more proposed solutions to the excessive cost. Supporting calculations, and further interpretative remarks if needed, are written on supplementary sheets; and these are attached to the Proposal. Promptly upon completion the Proposals are deposited with the Committee secretary.

It is axiomatic that a very large if not a major portion of a Cost Reduction Program will be pursued in the production areas. Inevitably, therefore, time-and-motion studies will be made. The degree to which these will conform to modern techniques will be a Management decision, and may reasonably depend upon the talents available within the plant. In any case it is quite possible to undertake time-and-motion studies without complete familiarity with the vocabulary and practices of specialists in this work. The work is largely a matter of common sense. A pre-requisite, however, is an understanding of the basic nature of motions. On page 66 is a discussion of basic motion definitions.

Cost vs. Tolerance

Although Production usually receives major attention in Cost Reduction work, the possibilities for dollar-savings in other divisions should not be overlooked. Product Design is a highly fruitful area for Cost Reduction investigation. The evolution of goods for sale usually starts with Product Design. The design is the parent of the product. Just as many of our own personal traits are inherited from our ancestors, so are the virtues and defects of a product to a great extent inherited from the design. An objective analysis of a company's design techniques and practices, followed up with improvements, can yield large savings.

A good way to start is with a close scrutiny of tolerances. In every instance that a tolerance can be increased without adversely affecting the product, a very real decrease in manufacturing cost will result. The Cost-versus-Tolerance relationship is shown in Figure 1. Almost without exception, a study of existing

. . . *Continued on Page 67*

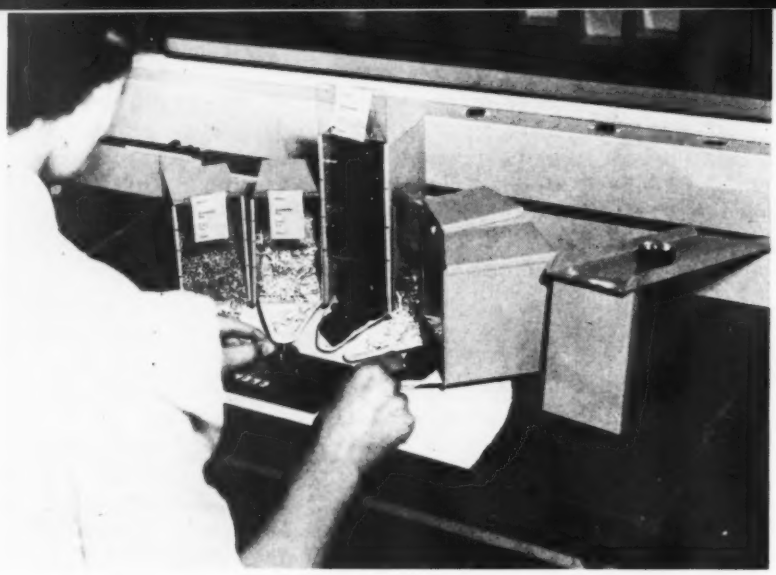

Fig. 2. Ready-Count Containers, mounted in a limited space on a work bench, can vastly improve the efficiency of practically any small parts assembly operation. Arranged fanwise, parts slide to finger-reach rather than arm-reach distance. Operator places assembly on gravity chute at right, from which it slides onto a belt transport.

Courtesy, Alden Systems Company

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It is worthwhile to initiate liaison with printers who specialize in composing and printing business and industrial forms. They have progressed too, and some of their ideas and innovations are germane to Cost Reduction. As an example, all of us are familiar with "snap-out" forms for multiple copies. But how many of us are aware that there is a chemically treated paper available that will make multiple copies **without** need for the carbon paper interleaves in the conventional "snap-out"? Thus the time for tearing out and throwing away smudgy carbons can be saved. And a thinner package goes into the typewriter, with a more legible back copy resultant.

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Before a new method is installed, foremen or supervisors should hold meetings with their people to explain the advantages of the proposed method as well as to encourage criticisms and suggestions. This gives people a chance to sell themselves on the departure from previous practice. They also become more interested in making the change work, because they have actually had a voice in it, and probably have made a contribution to it.

And the good results from improvements should be publicized within the plant. When savings start to show, experience argues that those who have had a hand in them, even remotely, should be informed through posters, the company organ, or bulletin board announcements. Aside from the immediate dollar savings realized, the program may help to pave the way for installation of such advanced managerial concepts as linear programming of production, statistical quality control, or a full-scale predetermined time standards program.

The establishment of a Cost Reduction Program will offer stimulating and exciting challenges. The returns to a manufacturing plant and its management can be most rewarding.

end

COMING NEXT MONTH: A discussion of how to reduce costs in engineering, research and development. Read "The Power of the Computer."

METHODS-TIME MEASUREMENT (M.T.M.), introduced publicly in 1948, utilizes the concepts of motion study pioneered by Gilbreth, incorporating them into a system for predetermining time standards. It is "a procedure which analyzes a manual operation or method into the basic motions required to perform it and assigns to each motion a predetermined time standard which is determined by the nature of the motion and the conditions under which it is made." A standards program based on M.T.M. will benefit a plant in many ways — reducing rate grievances, speeding up operator training, providing a basis for more effective work simplification. Ref: "Methods-Time Measurement", by Maynard, Stegemerten, and Schwab; McGraw-Hill Book Co., Inc.; 1948.

Use Standard Components for Special Machine Tools

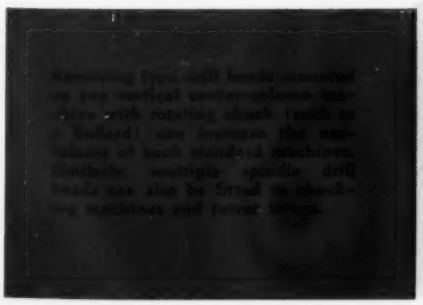
by Watson N. Nordquist
Managing Editor

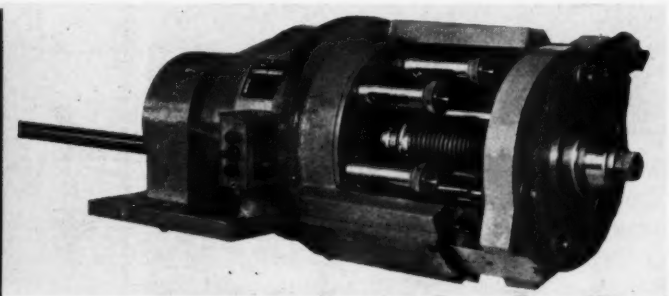
OF GREAT SIGNIFICANCE to manufacturers across the country is the increasing availability of major machine tool components up to 60 hp in capacity. This means that hundreds — perhaps thousands — of plants large and small, making a great variety of products, can readily enjoy the same benefits of special machinery and even automation that have become common to the automotive industry.

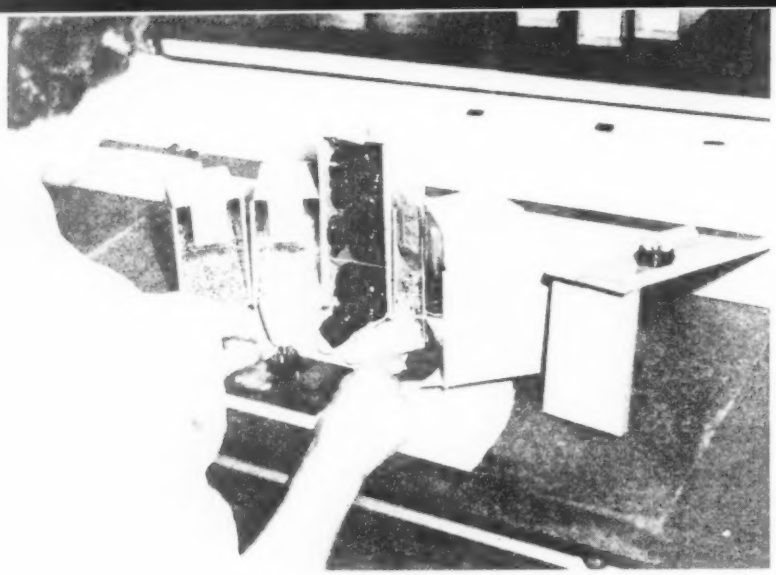
Many of these plants have already tasted the fruits of special machines and of automation. Many have bought or built automatic machine tools, utilizing standard machine units to achieve a higher production rate at a minimum cost/unit and with minimum lead time for tooling-up. But, in general, the standard machine units available on the open market have been of light horsepower ratings — many up to 1 hp, some up to 3 hp, and only a few above 3 and up to 60 hp. That is, there is only a handful of **sources** for units over 3 horse.

The pioneer in making standard, off-the-shelf units available to all Industry for heavy machining operations has been the Michigan Drill Head Company of Detroit. Through the years this company became widely known for its multiple drill heads and, within the automotive industry, as a builder of multi-station special machines. Today it also manufactures for sale on the open market, as well as for use in the special machines it builds, a broad line of standard heavy-duty machining units.

At the end of World War II and into '48 and '49, there was a marked trend in the automotive industry toward greater and greater use of special multi-station machine tools without much consideration for product changes. By 1950 most major production lines in the industry had been equipped with transfer machines,







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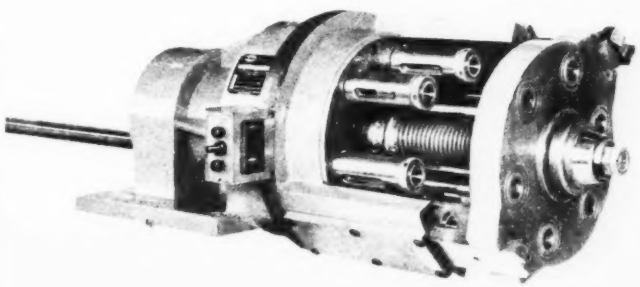
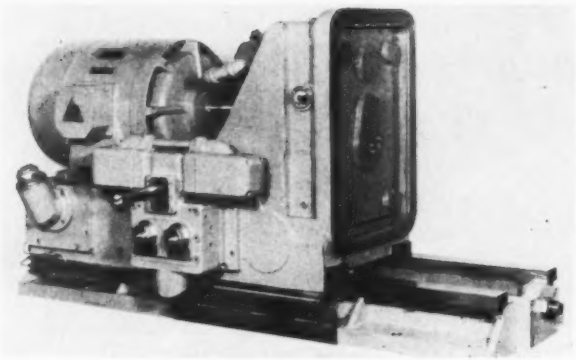
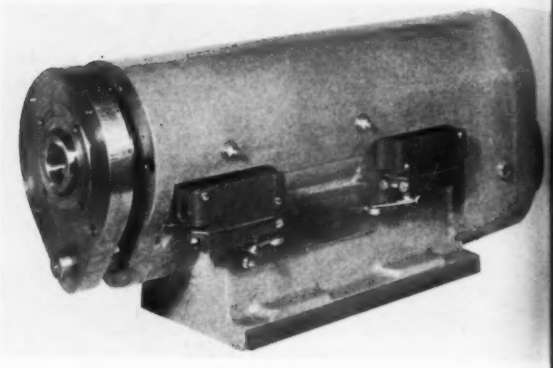
Revolving type drill heads mounted on any vertical center-column machine with rotating chuck (such as a Bullard) can increase the usefulness of such standard machines. Similarly, multiple spindle drill heads can also be fitted to chucking machines and turret lathes.





Standard Self-Contained
Way-Type Feed Unit



Standard Lead Screw
Tapping Unit

TYPICAL COMPONENTS FOR SPECIAL MACHINE TOOLS

competition became keener, model changes more frequent. Although standard machine components had been used previously, there now was a very definite industry demand for extensive use of standard machine units to facilitate retooling and reduce the obsolescence factor.

A few builders of special machines had anticipated the need; others met the challenge until today most of the leading builders incorporate standard units in the special machines they build. Unfortunately, the builders are not always as quick to furnish replacement units as they were to build original equipment. Unfortunately, they are not all willing to assist a customer in revising his line to accommodate a product change or a different product. Unfortunately, not many will sell their standard units to the customer who is changing over a machine originally bought from some other builder. And only a few will sell their heavy-duty units to manufacturers who wish to build their own special machines.

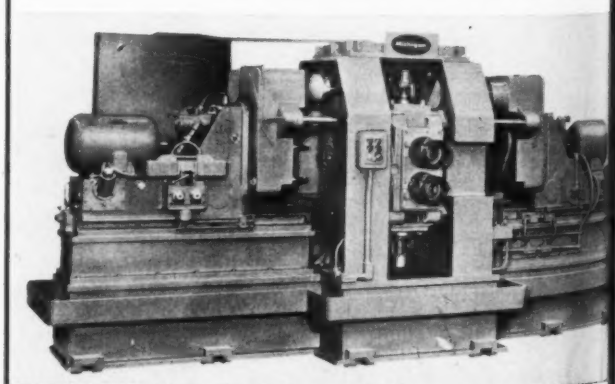
Executives of Michigan Drill Head Company feel that these conditions are changing rapidly. The pattern is set, they say, and other builders have little choice but to follow the trend. They point to the substantial savings in the builder's own engineering and manufacturing operations, to the increasing need for greater market sensitivity, and to the expanding market for automation in many industries.

The Machine Builder Benefits

Jerome Sullivan, Michigan Drill Head's aggressive president, claims it makes much sense for the machine builder to use standard components . . . even without considering customer needs. "We have a diversified line of units we can manufacture year in and year out," he says. "This helps to create a production level in our own shop, makes continued maximum use of our facilities and manpower, and permits economical production runs."

Sullivan calls attention to the current shortage of engineering talent. He points out that with more and more firms getting into automatic production, the engineering scarcity will become even more acute. "With engineering hours at a premium," he says, "the use of standard components saves much board time in the development of special machine tools."

Double-End, 4-Station
Trunnion Type Machine
for Refrigeration Compressor Housings



Standard Hydraulic Index Table

Like other progressive special machine builders, this company has standardized various features of machine design, thus eliminating the need for starting from scratch on every detail. This standardized design principle is applied to spindle, gear train and bearing construction; hydraulic clamping on rotary indexing machines; base construction of wing units and dial type machines; and many other details.

To keep pace with technological developments, standard units and design details are constantly studied for advisable refinement. Although changes are frequent, interchangeability of the unit with earlier models is always a requisite.

As a striking example of how this standardization keeps things moving at Michigan Drill Head, let me tell you about a 78-station transfer machine. In early November, I saw a proposal being drawn up for this machine. In early May, I again visited the plant and the machine was under construction with the base laid halfway down the line and many of the first stations virtually complete. The machine is to be delivered to the customer this month.

This machine is not for an automotive plant. It is for three different but similar compressor housings, all of which are to be processed over this same machine. Maximum changeover time is expected to be 8 hrs. Standard machine components are used extensively and numerous product changes can be accommodated without extensive machine rebuilding.

The Machine User Benefits

Whether a manufacturer buys a special machine or builds his own, the use of standard components presents numerous advantages:

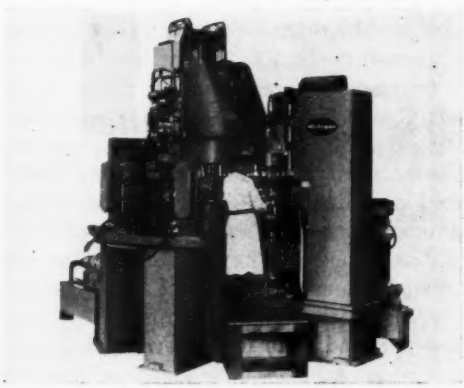
- Lower initial cost of the machine.
- Faster delivery of the machine.
- Minimum repair time.
- Interchangeable replacement parts and entire units.
- Future retoolings facilitated.

Michigan Drill Head's standard heavy-duty units include vertical and horizontal hydraulic drill heads, self-contained quill and bar type lead screw-tapping units, hydraulic index

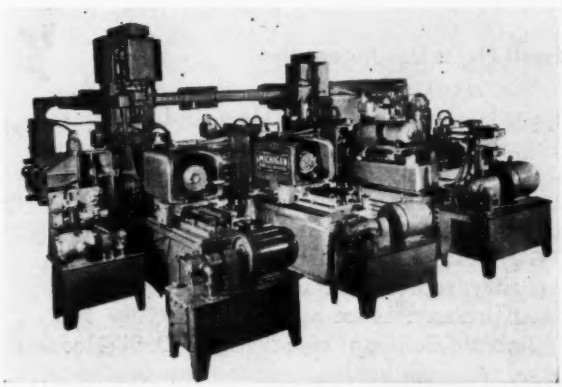
TYPICAL EXAMPLES OF SPECIAL MACHINES BUILT FROM STANDARD COMPONENTS

Flexibility is a feature in each of the above machines. At the left, pot-type boring heads can be readily changed on the opposed standard way-type feed units to meet any model changes. At center, all horizontal units are provided with angular adjustments. At right, transfer machine has been retooled four times for model changes.

11-Station, 2-Position Dial Type Machine for Farm Implement Pump Bodies



Four Double-End Transfer Machine for Torque Converter Housings



tables, and others. These can be used in combination with components available from other manufacturers to build many special machines quickly and at low cost.

A great variety of standard machine accessories are also available from various sources. These include air and electrical controls, motors, bearings, and many others. Hydraulic components made by at least four builders are fully interchangeable. Transfer mechanisms of standardized design can also be had.

J.I.C. standards permit complex electric, hydraulic, or pneumatic diagrams to be followed accurately by machine builders or maintenance men at distant locations. With skilled help at a premium, particularly in low-developed areas, these standards are of great importance to the manufacturer contemplating the use of special machines.

T. W. Farron, fiery Michigan sales manager, says that the use of standard machine components should be considered very early in the planning of new production facilities. "A master mechanic or equipment engineer," he says, "can easily visualize that once a need is recognized, the sooner he gets the machine on his floor, the sooner he makes money from it. The question of survival in a highly competitive field is often settled by who's first on the market with a new product."

Farron believes that many small plants with substantial production runs, but not necessarily continuous production, can enjoy the same benefits of automation in heavy machinery as are common in the large automotive plants. Farron cites quality as being a major objective. Elimination of the human element and manual handling of workpieces invariably results in more uniform quality and greater interchangeability of product parts.

A small plant can often save itself the expense of plant expansion by squeezing more machine into the same space. A multi-station automatic machine uses much less floor space than individual standard machines for equivalent production.

Small Plants Use Automation

The recent ASTE survey showed a widespread interest in automation and **intent to automate.** There was much earlier evidence of this interest by plant executives in virtually every segment of Industry and every size plant. For instance, TOOLING & PRODUCTION editors had noted the diversification of industry represented by readers who stated their preferences for automation articles.

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Business Week recently called attention to the heavy mortality among appliance manufacturers and predicted that the present array of 150-odd manufacturers of major appliances would eventually be whittled down to a half-dozen giants and a scattering of independents. As the noted columnist on economics, Sylvia Porter, says, "The problem starts far back on the line — is a battle of production and distribution." The same trends are fast shaping up in other industries as well.

Isolating the problem of automating heavy machining operations — involving both large and small plants with substantial production runs on castings and forgings — here are the conditions that exist, according to Michigan's Farron:

- Many companies, in order to use special machines, would have to run a variety of similar parts through the same equipment. Michigan Drill Head already has supplied five customers with machines having such flexibility. In such instances, standard machine components are essential to facilitate changeovers.
- Limited production runs may make the economics even of multiple drilling a question. The price of large fixed drill heads, weighed against limited use, is often prohibitive. It is essential to use a standard head made for interchangeable pots designed specifically for each hole pattern.
- Many plants have little funds for capital investment. With proper facilities and nominal engineering assistance, they can often build their first "specials" by maximum use of standard components.
- Many plants in their approach to specialized equipment can add standard units to their present standard machine tools. In fact, they should be extremely careful not to overlook the possibility that automating conventional machines will be more economical than entirely new special machines.
- In virtually every industry, there is an increasing need for greater market sensitivity. When the market slackens, or a competitor introduces a sensational new model, or technological development demands it, Manufacturing must be ready to move fast into production of a new model or new product. The use of standard interchangeable machine components both reduces machine obsolescence and shortens the lead time for a new tooling program.

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ANALYSIS: Manufacturing Costs as Related to Product Design

by Lad J. Bayer
Chief Industrial Engineer

THE WARNER & SWASEY COMPANY
Cleveland, Ohio

IT IS COMMON KNOWLEDGE that product design determines manufacturing costs, and that choices do exist between design elements which can either increase or decrease product cost. Yet during the formative stage of design or even during the preparation of detail part drawings, design engineers have little more than personal experience or common sense to guide them toward the desired goal of optimum quality at lowest cost.

Viewing the situation in the light of modern industrial trends wherein the developments of accelerated scientific research are being rapidly absorbed into active social use, we find designs becoming more and more complex.

Adapted from a paper presented at the American Society of Mechanical Engineers' Semi-Annual Meeting, June 1956.

Recognized engineering boundaries are being crossed so extensively that specialization is the only avenue open to meet these growing challenges. But engineering specialization is a diluting influence requiring coordination if the common objective of optimum quality at lowest cost is to be attained.

The Engineer's Responsibilities

In designing products, engineers have responsibilities and objectives which can be summarized to include function, durability, appearance and cost. Although the order of importance varies from product to product in harmony with end use, cost is always of prime consideration. Thus, with any product, it is the design engineer's task to attain as nearly as possible a balance between function, durability, appearance and cost.

Reflecting upon the first three points, it is apparent they are in reality derivatives of overall quality and, as such, are its measure. For is it not true that favorable change in any one or all three is universally judged as improvement in quality? And further, comparisons made between two like or similar end-use commodities, with respect to the three considerations, classify one as being a graded increment better in quality than another.

At this point recognition must be given to the fact that overall quality is very closely allied to cost; they are inseparable twins. Improvements in quality too often result in increased cost, and conversely lower costs too often result in lesser quality. They have a natural tendency to behave as directly proportional variables. This is demonstrated in the charts that follow.

Engineers, on the other hand, are continually challenged to force quality and cost apart. Their constant pursuit is either to maintain quality at lower cost or to improve quality at fixed cost. In attempting to carry out such assignments, however, the engineer consistently finds himself handicapped through lack of cost information that would readily guide his selection of quality level with acceptable margins and within reasonable cost boundaries.

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In designing products, engineers have responsibilities and objectives which can be summarized to include function, durability, appearance and cost. Although the order of importance varies from product to product in harmony with end use, cost is always of prime consideration. Thus, with any product, it is the design engineer's task to attain as nearly as possible a balance between function, durability, appearance and cost.

Reflecting upon the first three points, it is apparent they are in reality derivatives of overall quality and, as such, are its measure. For is it not true that favorable change in any one or all three is universally judged as improvement in quality? And further, comparisons made between two like or similar end-use commodities, with respect to the three considerations, classify one as being a graded increment better in quality than another.

At this point recognition must be given to the fact that overall quality is very closely allied to cost; they are inseparable twins. Improvements in quality too often result in increased cost, and conversely lower costs too often result in lesser quality. They have a natural tendency to behave as directly proportional variables. This is demonstrated in the charts that follow.

Engineers, on the other hand, are continually challenged to force quality and cost apart. Their constant pursuit is either to maintain quality at lower cost or to improve quality at fixed cost. In attempting to carry out such assignments, however, the engineer consistently finds himself handicapped through lack of cost information that would readily guide his selection of quality level with acceptable margins and within reasonable cost boundaries.

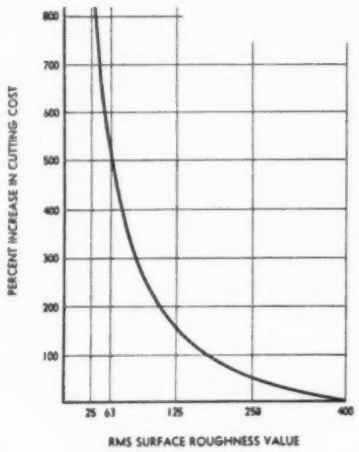


Fig. 1. Cost comparison chart in which cost is plotted with respect to surface quality standards.

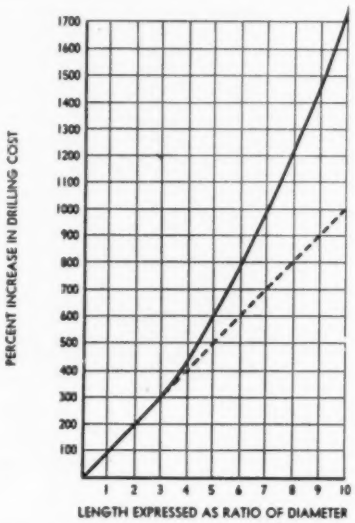


Fig. 2. Cost comparison of varying the depth of holes drilled.

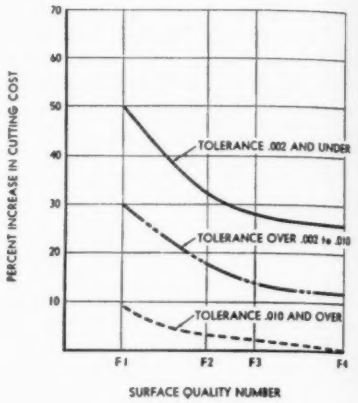


Fig. 3. Cost comparison showing the effect of two quality variables — surface quality and dimensional tolerance.

His only existing alternatives are either time-consuming research or willingness to gamble on assumed conditions. Unfortunately, in too many instances the design engineer is forced in his struggle for assured function, durability or appearance to postpone many cost considerations. Then, when such information becomes available through actual production experience, positive and corrective action becomes possible.

The greater the urgency for decision the greater in number are the assumed conditions and the greater the attendant risk of unreliability. Facts are elusive things, consuming vast amounts of human energy, time and expense to seek out. Verification of this last statement can be found throughout Industry, for five years between first inception of a new product or model to its ultimate marketing is not an uncommon experience. In relatively recent time, however, Industry has learned to approach such formidable challenges through the mechanics of defined standardization which permits division of large, infinite problems into smaller portions that can be resolved individually into practical solutions.

Cost Patterns

Applying this concept to the problem outlined, we find that some areas of quality, though limited, can be resolved into definable increments lending themselves to measurement. For instance, standards of dimensional tolerance and surface roughness are not new to Industry. Continuing in the progressive steps of logic, it should, therefore, be feasible to track down cost patterns in relation to these standardized quality increments.

At The Warner & Swasey Company we found these cost-behavior patterns hidden in the industrial engineering data designed for use in plant operational control. The cost patterns were not readily apparent because the data were in a language adapted only for the use mentioned in the foregoing. If a way could be found to extract, translate and condense the information into a form meaningful at the drafting board, it would provide the design engineers with some of the information sought. In addition, the implied gains in reduced engineering time and development expense would accrue from its broader use.

Since the function of an industrial engineer in many manufacturing organizations is to translate product requirements into processing plans and labor time standards, the data compiled as a result of his activity should reflect cost information in defined form. A cursory examination of such data will prove the point. With the knowledge that time is one (though not the only) measure of cost, it should be possible to tabulate time or cost differentials for all standardized quality differentials. Such analysis of any industrial engineering data will reveal that cost varies with varying quality specifications, and that the degree of change is predictable.

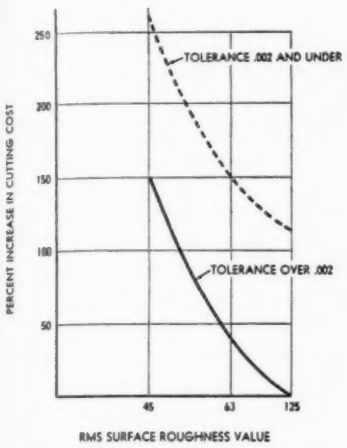


Fig. 4. Comparing surface quality and dimensional tolerance in face milling.

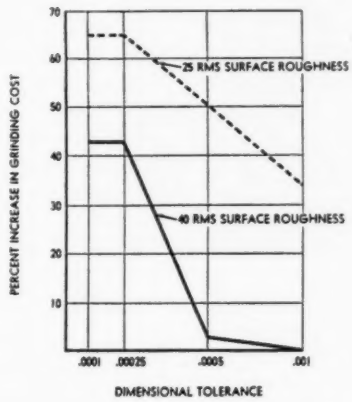


Fig. 5. Comparing surface quality and tolerance in cylindrical grinding.

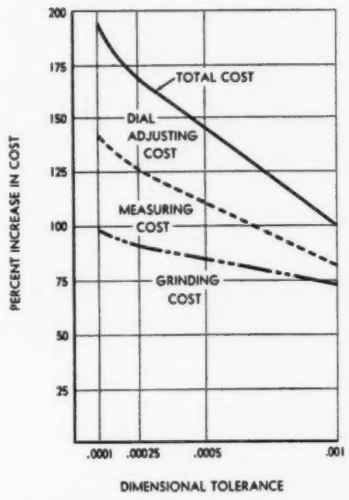


Fig. 6. Comparing varying tolerances in internal grinding.

Using the data available at Warner & Swasey, analyses were made to test the practicability of the idea and to verify that quality specifications and industrial engineering data could be compounded into simplified form. The findings demonstrated that it was possible to plot variables of quality against variables of cost on charts that are easily understood and quickly read. The accompanying charts are examples of the results obtained. Although at present they are limited in scope, the hope is that further developments will expand the idea into broader areas of design features.

Cost Comparison

In Figure 1 is a representative cost-comparison chart in which cost is plotted with respect to surface quality standards, and limited to the turning process as done on turret lathes. Note how easily the choice of functional surface quality for any application can be made, with full knowledge of comparative cost.

The chart in Figure 2 was prepared to illustrate the cost behavior of one frequently occurring element of design, drilled holes. From the chart it is readily apparent that deep holes are expensive. Beyond the depth of three times the diameter, the cost rises more rapidly than equal increments of depth. The dotted line is shown merely to highlight the accelerated cost.

It should be stated at this point that only standard drilling facilities were covered by the data. Special oil-hole drills or special trepanning tools would reflect cost patterns at variance with this chart. Such tools and supporting facilities are costly and their use would have to be justified through amortization requiring prolonged design product life and quantity production.

Planing Operations

Though planing is not used extensively in Industry, it was an important process in the plant covered by the data and provided quite comprehensive information. Figure 3 is a cost-behavior chart on planing, demonstrating the effect of two quality variables—surface quality and dimensional tolerance. It should be noted how readily the quality variables can be judged separately or in combination. In this case, surface quality was defined by coded numbers supported with visual samples, since rms values did not express the desired control.

Figure 4 is an additional illustration of a cost behavior chart combining the same two quality variables, but in this instance related to face milling. It is interesting to note the wide cost differentials throughout the range of defined quality.

The chart in Figure 5 showing cylindrical grinding cost is unique in that it exposes a nonuniform cost-behavior pattern. As can be seen, the 40 rms surface quality line shows a minor cost rise between the 0.001 and 0.0005 tolerances followed by an abrupt rise between

the 0.0005 and 0.00025 tolerances. The 25 rms surface quality line, on the other hand, reflects a more normal and usual cost behavior relative to tolerance.

In preparing the chart on internal grinding cost (Fig. 6), the intent was to expose some of the hidden elements that compound into the resultant cost behavior. From the chart it is apparent that though the reducing tolerance increases the cost of grinding, substantial cost increases occur from the effects upon the machine operator in the form of increased gaging and dial-readjusting time.

In reciprocating or surface grinding, the dimensional tolerance range has greater cost effect than the surface-quality range, as seen in Figure 7. It is apparent, in addition, that cost rises sharply with tolerances less than 0.001".

Incorporating Quality Features

The illustration in Figure 8 is presented to further demonstrate, as was done in Figure 2, the possibilities of incorporating quality features other than surface roughness or tolerance. The difference between the two curves is method, governed by the design of the part. In order to gain the benefit of the low cost "through-feed" method on the centerless grinder, the ground diameter must be the largest dimension on the part. Should such design be impractical, the engineer is guided toward selection of a generous tolerance for the resulting "in-feed" method in order to minimize cost.

The final illustration in the series of simplified cost comparison charts (Fig. 9) covers rotary surface grinding. It is presented primarily to demonstrate that cost is not severely affected by quality variation in all cases. Here the full cost increase over the whole tolerance range is 15% and is by far smallest of all the illustrations. Yet even in this narrow range it is quickly seen that more than half the cost increase occurs between the 0.001 and 0.0005 tolerances.

As already mentioned, these charts by no means demonstrate the total scope of possibilities. More recent studies have shown possibilities in the direction of compounding such comparative data into more comprehensive form permitting greater selectivity of conditions.

The charts illustrated were tailored to suit the conditions of the plant under study and based on data confined to that plant, so the cost-behavior patterns may not wholly or accurately agree with the experiences of other plants. Recognition must be given to the fact that differences in facilities, processing methods, and quality range will affect the character of the cost behavior pattern. The principle, nevertheless, is applicable to any manufacturing organization and adoption merely requires but the creation of charts conforming to the needs of the plant in question. The ease with which it can be done by many manufacturing organizations will be determined by the degree of standardization and availability of corresponding industrial engineering data. **end**

Fig. 7. Comparing surface quality and tolerance in reciprocating surface grinding.

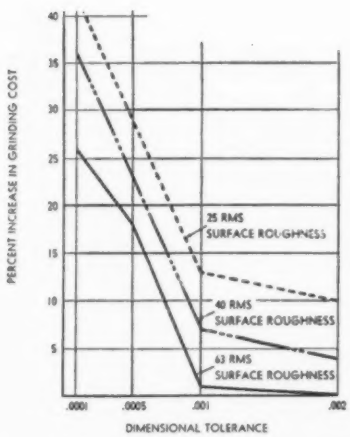


Fig. 8. Comparing tolerance and design in centerless grinding.

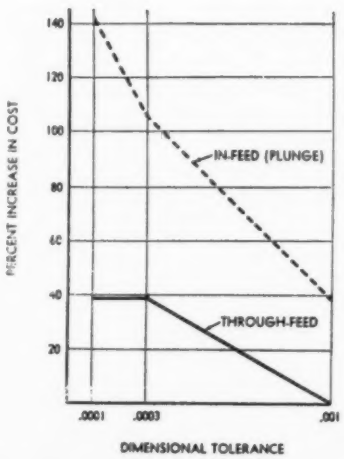
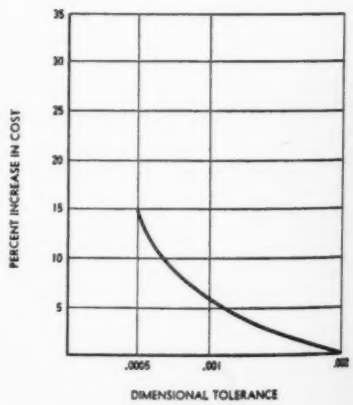
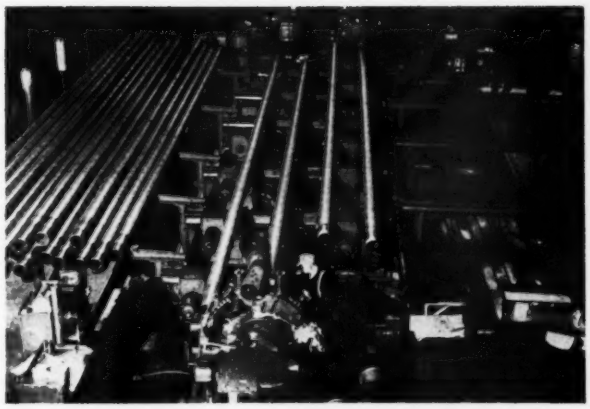


Fig. 9. Comparing varying tolerances in rotary surface grinding.





Threading of oil well casing and handling operations for threaders from the charging table (left) to the discharge table (right) have been completely mechanized in the Spang-Chalfant Ambridge plant of The National Supply Company for five pairs of Stamets threaders.

Modernization for

AUTOMATED THREADING

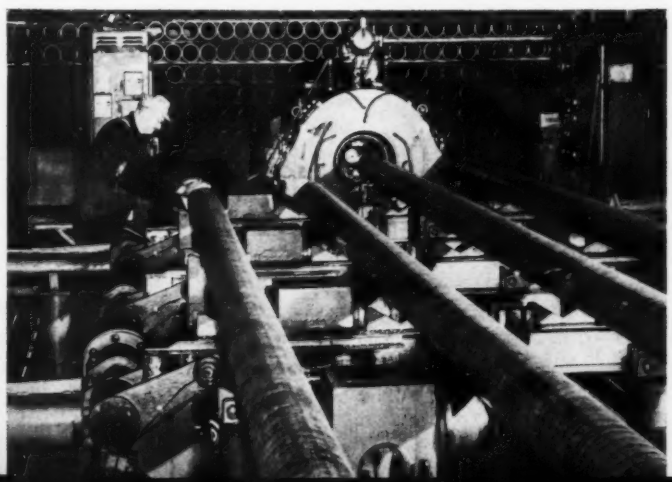
AUTOMATION OF THREADING operations on oil well casings up to 13⅜" O.D. was completed recently in the Spang-Chalfant Division plant of The National Supply Company in Ambridge, Pa.

The pipe handling table has four positions for pipe, two for each threader. The two threaders operate simultaneously on two lengths of pipe. As soon as they are completed the chucks release the two pipes and powered rollers eject them to the table where a simultaneous shift of five lengths of pipe occurs.

The finished pipe is transferred to the discharge table as a new length is picked up from the charging table. Two sets of conveyor rollers then turn in the opposite direction to inject two lengths of pipe into the floating chucks which center the pipe in the threaders for the next threading operation.

Each of the five pairs of threading machines is now operated by one operator, whose duties include inspection of the threaded pipe. The conversion to automatic operation was accomplished by modification of six machines already in use in the plant and replacement of four obsolete machines.

Modifications provided an elevating mechanism to adjust the height of the Stamets threaders for different pipe sizes and addition of electrical apparatus and limit switches for controlling the automatic operations, including air-operated mechanisms on the machine and pipe handling conveyors.

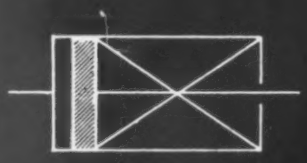


With pipe threading fully automated, the operator of a pair of machines has enough time to inspect finished threads as well as adjust threaders and automatic handling machinery and change chasers when necessary.

WORKING LINE

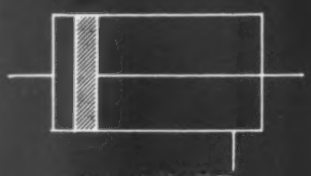
EXHAUST LINE

FLOW DIRECTION



CYLINDER
SINGLE ACTING
SPRING RETURN

QUICK
EXHAUST
VALVE



CYLINDER
DOUBLE ACTING

CHANNELING AIR.....

THE MANY PNEUMATIC AIDS to industry would be of little use, were it not for the ingenuity of the manufacturers of valves in providing the means of controlling these devices.

The proper channeling of compressed air, by valves, to pneumatic power devices means that you will have the intended power where you want it, when you want it, in the quantity desired, and at the necessary speed of delivery.

To some, the confusing thing about an air valve is its name. Two-way, three-way, four-way, what does the manufacturer mean? This may sound very elementary and perhaps it is, but we were surprised in finding that few technical men know what a three-way valve is, or four-way and other valves that we will discuss.

For simplicity, in all instances we will speak of valves operating air cylinders, and J.I.C. (Joint Industry Conference) standards have been arranged on each spread for your convenience. It is the intent of the writer to keep the circuits basic and uncomplicated, that the reader can come to know **valves** on this trip, and at a later date be able to follow the more complicated circuitry which will be presented.

Please understand that there are many more special valves available than will be discussed here. The specials and those requiring more detailed description will also come in a future sitting. It should be noted, also, that there are many manufacturers offering comparable valves which are being called by different names, due to individuality or to the distinctive features of one compared to another.

To put it simply, there are only two types of valves for the channeling of air. There are other types of valves but only two types for the channeling of air. Around these two types — the three-way and the four-way valves — there are built all the specials.

You say, "what happened to the two-way valve?" The two-way valve is nothing more than a shut-off valve. Two-way means

TOOLING Air Power FOR METALWORKING

...IR ... *Valves and Their Use in the Control of Pneumatic Equipment*

by William E. Hoffman
Associate Editor

two ports; three-way, three ports; and four-way, four ports. Since the shut-off valve really has no place in the channeling of air, we will spend little time with it.

• THREE-WAY VALVES have an inlet port, an exhaust port, and a port to be piped to the cylinder. Their most common use would be with a cylinder that acts only in one direction and is spring return. These valves may be had either in the normally closed or normally open construction. A normally open valve would be one in which the flow is to the cylinder when in its normal position.

[Before we go any farther, it should be noted that most of the valves discussed in this article can be purchased for operating manually, mechanically, electrically or by a pilot valve.]

• FOUR-WAY VALVES are manufactured in 2 types, either the 2-position or the 3-position type. Four-way valves can be used in many ways; one four-way valve can be used to operate a double acting cylinder or it can operate two double acting cylinders.

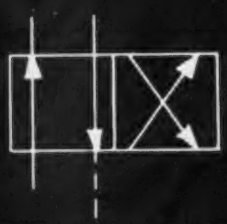
Where one four-way valve of 2-position construction is used to operate two air cylinders, the first position will find No. 1 cylinder receiving air while the No. 2 cylinder will be exhausting. In the second position of this valve, the No. 1 cylinder will be exhausting while the No. 2 cylinder is receiving air.

Where two cylinders are being controlled by a 3-position four-way valve, the second position of the valve will be neutral with both cylinders exhausting. In the first and third positions of the valve, the cylinders will be operating as if controlled by the 2-position type of this valve.

The 3-position four-way valve is necessary in machine tool application where an air cylinder is used for rapid traverse and then another source of power takes over for feeding the cutter into the work. In this case the inlet

MANUAL
SHUT OFF VALVE

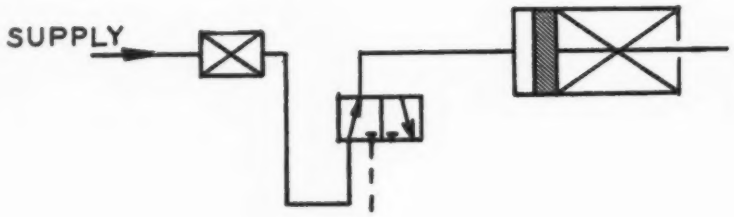
DIRECTIONAL VALVE
2 POSITION
3 CONNECTION



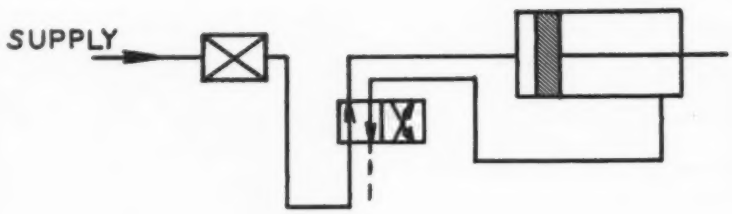
DIRECTIONAL VALVE
2 POSITION
4 CONNECTION

VARIABLE
RESTRICTION

1. TWO-WAY. Air cylinder shown, purchased to do work on the out stroke. No valve furnished except shut-off valve. Piston can only operate once, out. Spring would return piston except line is blocked for exhausting air.



2. THREE-WAY. Same air cylinder, now supplied with a three-way valve. Valve has 2 positions. First position, air will move piston to right. Second position, supply is shut off and exhaust allowed to escape through same line that air previously entered.



3. FOUR-WAY. Shown here is a double acting air cylinder. It has been installed to do work on the out stroke with air return, or to do work on both strokes, in and out. To accomplish this, a four-way, 2-position valve has been furnished in the lines.

SHOWN ABOVE ARE EXAMPLES OF THE USE OF THE 3 BASIC VALVE TYPES

valves could be closed while the cylinders are allowed to exhaust while being motivated by other means.

Another widely used application of the 3-position version of the four-way valve is where undetermined arresting of motion is necessary and then the motion carried on by inching.

● PILOT OPERATED VALVES function in the same manner as regular valves; pilot operated valves have greater flexibility in that they can be situated in remote areas that would be most inconvenient to reach for manual operation. This type of valve is similar to a solenoid valve in that both are triggered by a remote force. Usually the pilot portion of a pilot operated valve is a small air cylinder or cylinders which actuate the valve in and out of its various positions. These small cylinders receive their power as compressed air directed through small tubing by a manual, mechanical or electrically operated actuating valve. The great savings comes in the use of small tubing from the actuating valve to the pilot operated valve, and the convenience of having your valving where it should be . . . not to mention the sequencing and the handling of complex problems with greater ease.

● SOLENOID VALVES are furnished in all the basic and special types of porting and functioning; however, unless they are purchased as explosion-proof, they should not be used in an explosive atmosphere. As the name implies, the positions of the valve are changed by one or more solenoids built into the valve itself. These solenoids receive their electrical impulses from small remotely located switches which are either manually, mechanically or possibly pneumatically operated. Here again a great savings is realized in original equipment and maintenance.

● FLOW CONTROL VALVES, or speed control valves, are

metering valves. Their purpose is to graduate the flow of air to or from the cylinders, usually from the exhaust port. If the speed of a piston is to be controlled in both directions, it will be necessary to use two of these valves.

Care should be taken to place them in the line in the proper end-for-end position as most makes of these valves have a through flow in one direction.

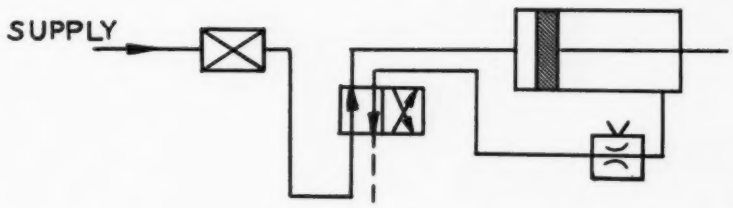
It is interesting to consider the reason for putting these valves in the line on the exhaust end of a stroke to smooth it out. Since the line pressure may fluctuate and since air is compressible, the back pressure created by this valve acts as a cushion to smooth out line fluctuations. Then too, if speed control valves were used between the main valve and the upstream end of the cylinder, there would be some types of main valve which would be caused to malfunction.

• SEQUENCING VALVES are a very economical device for effecting the automatic follow-up of one operation after another. They work like this: a valve is triggered to start the cycle and the first air cylinder is brought into play; after the first air cylinder completes its stroke, the pressure builds up in the line until the sequence valve opens at its pre-set pressure, and air is channeled to the next cylinder and so on. The pressure build-up is against a spring loaded valve seat.

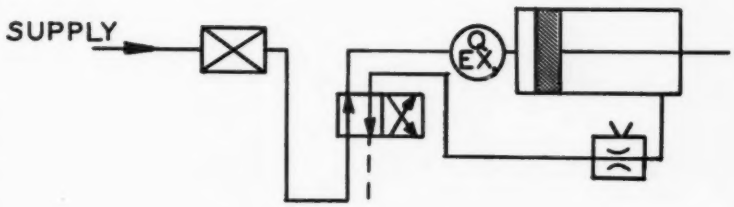
For the most part these valves are not usable where the air pressure is erratic from large volumes of air being used intermittently in the plant or from faulty supply equipment.

Where definite pressures are known to be needed in several steps of a sequence, it is not advisable to use sequencing valves to produce this pressure.

Valving in pneumatic circuits is like many other arts peculiar to the Metalworking Industry; it is not complicated when broken down into its elementary aspects.



4. Four-Way valve, with flow control valve added to circuit. This circuit does the same work as the previous circuit with the added feature of being able to control the stroke of the piston to the right. It can be slowed down to any desired speed. Note that the metering is done on the exhaust from controlled stroke.



5. Four-Way valve, with flow control valve, and a quick exhaust valve added to facilitate a fast return of piston to the left. Although there is no restriction to exhausting air from the left of piston back through valve to the atmosphere, providing the four-way valve has been set for this phase of the cycle, there is a definite drag or friction. Piston return, even with air pressure will be slowed, unless a quick exhaust valve is supplied close to cylinder exhaust port for this phase of cycle.

The whole is made up of many little basic principles. We have in this limited space discussed only basic principles, and you should be cognizant of the fact that there are many more elements which go into a pneumatic system in order that it may function properly. This discussion is merely the jumping off place for future delineation and perhaps more interesting discussion — when more complicated and practical applications will be forthcoming.

end

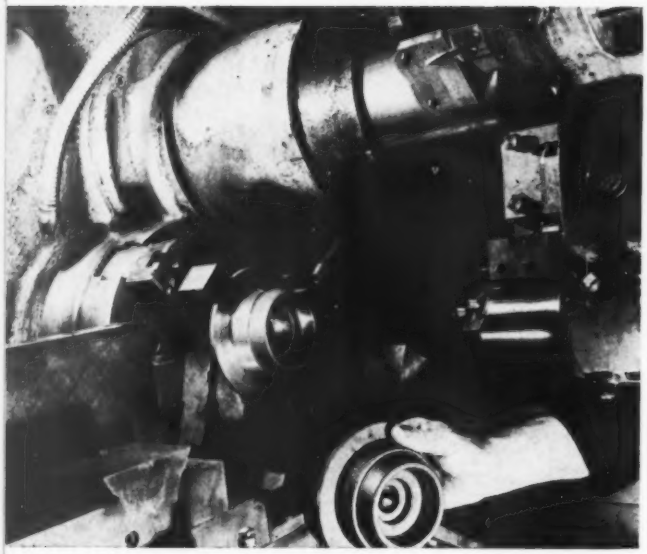


Fig. 1. This Warner & Swasey automatic chucker is employed in Clark Equipment Company plant for making cuts here shown on bearing caps. Tools are quickly set and are good for 5,000 parts between grinds.

Automatic Chuckers Expedite Multiple Cuts on Bearing Caps

THE EASE AND RAPIDITY with which setups can be made are important factors in a shop that handles a wide range of parts on which many short runs are included and where setups have to be changed often. This applies to many machines used in the Jackson, Michigan plant of Clark Equipment Company. Among these is a pair of No. 2 AC Warner & Swasey chuckers. These are shown in Figures 1 and 2, and involve setups for the production of cast iron bearing caps.

In the first of these machines, Figure 1, two steps of a three-step bore are finished by a pair of carbide tools in a DeVlieg holder that is sturdy besides having very handy means for precise tool setting. A side head having a single square Kennametal tool faces the large flange and turns the adjacent OD. This tool is given a 0.021" feed per revolution with the work turning at 134 rpm. 5,000 pcs can be produced per grind as far as these cuts are concerned, the work being held in a three-jaw air clamping chuck.

After the above operations, the bearing caps go to the second machine, Figure 2, in which an air-clamping Speedgrip expanding chuck is used. This holds the work while one tool finishes the third and smallest step of the bore and a crossfed tool faces the second side of the flange and turns its OD.

These operations are performed at about the same speed as they were on a vertical turret lathe that is a much heavier machine, but the setup time is greatly decreased and offers special advantages when rather frequent changes in setups are required. end

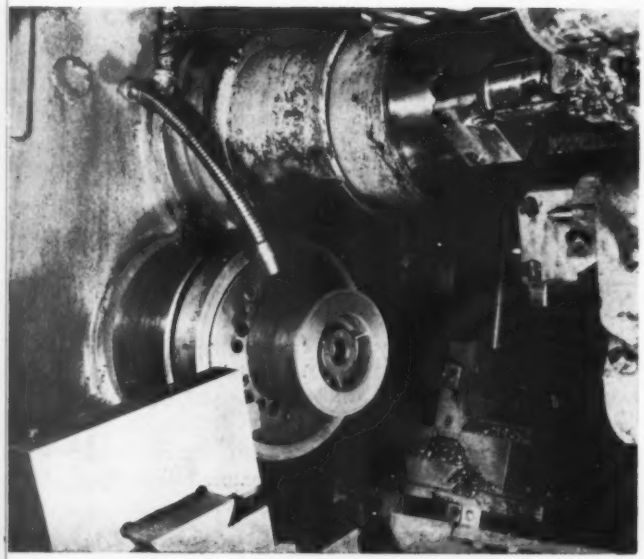


Fig. 2. In this second Warner & Swasey chucker, the final operations are performed rapidly on the bearing caps as they are held by an air-operated Speedgrip chuck. Setup time is short and adds to economies, particularly on short runs.

Some Basic Aspects of Numerical Machine Tool Control

by L. W. Herchenroeder
Industry Engineering

WESTINGHOUSE ELECTRIC CORPORATION
East Pittsburgh, Pennsylvania

NUMERICAL CONTROL OF MACHINE TOOLS has excited the interest of machine tool builders, users, and electrical manufacturers. The benefits to be obtained by external programming of the operations of an automatic machine on cards or tape are attractive and a number of machines have been and are being built to obtain these benefits. The diversity of these efforts have emphasized the need for a consideration of their fundamentals to provide a common basis for the discussion of physical systems.

The various functions involved in the numerical control of a hypothetical machine tool are shown in the block diagram of Figure 1. Many systems do not have all of the functions listed and the functions may not be in the same relative locations. This will affect the apparatus physically but is not important

*Presented at the 20th Annual Machine Tool Electrification Forum; sponsored by the Westinghouse Electric Corporation.

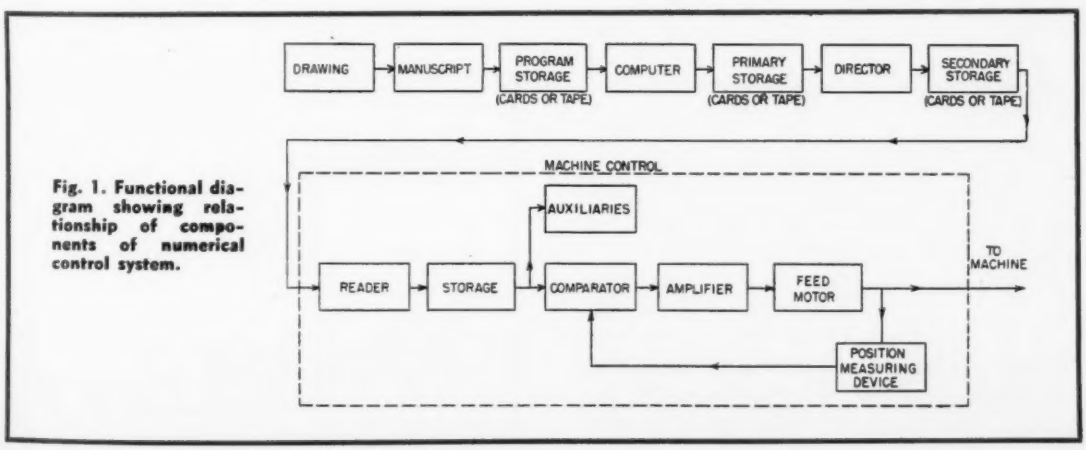


Fig. 1. Functional diagram showing relationship of components of numerical control system.

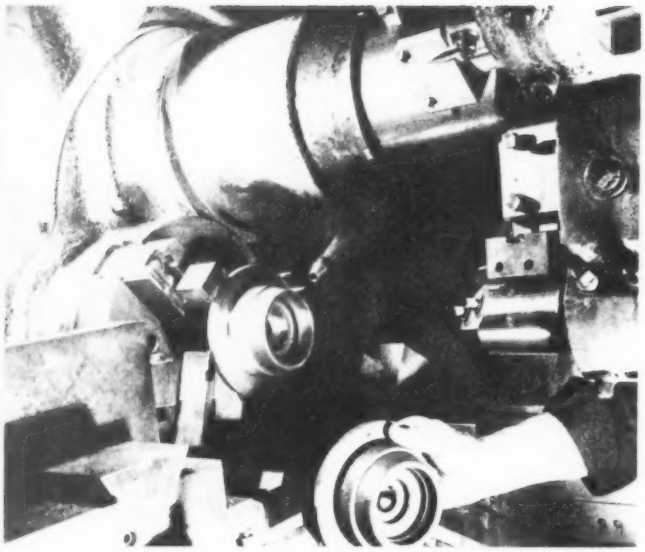


Fig. 1. This Warner & Swasey automatic chucker is employed in Clark Equipment Company plant for making cuts here shown on bearing caps. Tools are quickly set and are good for 5,000 parts between grinds.

Automatic Chuckers Expedite Multiple Cuts on Bearing Caps

THE EASE AND RAPIDITY with which setups can be made are important factors in a shop that handles a wide range of parts on which many short runs are included and where setups have to be changed often. This applies to many machines used in the Jackson, Michigan plant of Clark Equipment Company. Among these is a pair of No. 2 AC Warner & Swasey chuckers. These are shown in Figures 1 and 2, and involve setups for the production of cast iron bearing caps.

In the first of these machines, Figure 1, two steps of a three-step bore are finished by a pair of carbide tools in a DeVlieg holder that is sturdy besides having very handy means for precise tool setting. A side head having a single square Kennametal tool faces the large flange and turns the adjacent OD. This tool is given a 0.021" feed per revolution with the work turning at 134 rpm. 5,000 pcs can be produced per grind as far as these cuts are concerned, the work being held in a three-jaw air clamping chuck.

After the above operations, the bearing caps go to the second machine, Figure 2, in which an air-clamping Speedgrip expanding chuck is used. This holds the work while one tool finishes the third and smallest step of the bore and a crossfed tool faces the second side of the flange and turns its OD.

These operations are performed at about the same speed as they were on a vertical turret lathe that is a much heavier machine, but the setup time is greatly decreased and offers special advantages when rather frequent changes in setups are required.

end

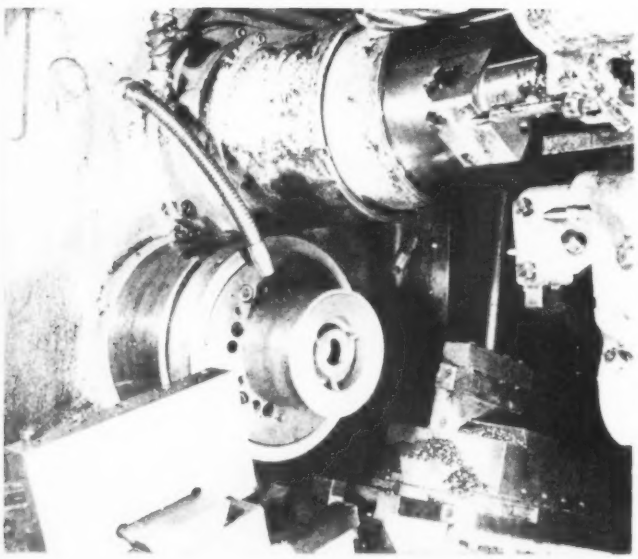


Fig. 2. In this second Warner & Swasey chucker, the final operations are performed rapidly on the bearing caps as they are held by an air-operated Speedgrip chuck. Setup time is short and adds to economics, particularly on short runs.

Some Basic Aspects of

NUMERICAL MACHINE TOOL CONTROL*

by L. W. Herchenroeder
Industry Engineering

WESTINGHOUSE ELECTRIC CORPORATION
East Pittsburgh, Pennsylvania

NUMERICAL CONTROL OF MACHINE TOOLS has excited the interest of machine tool builders, users, and electrical manufacturers. The benefits to be obtained by external programming of the operations of an automatic machine on cards or tape are attractive and a number of machines have been and are being built to obtain these benefits. The diversity of these efforts have emphasized the need for a consideration of their fundamentals to provide a common basis for the discussion of physical systems.

The various functions involved in the numerical control of a hypothetical machine tool are shown in the block diagram of Figure 1. Many systems do not have all of the functions listed and the functions may not be in the same relative locations. This will affect the apparatus physically but is not important

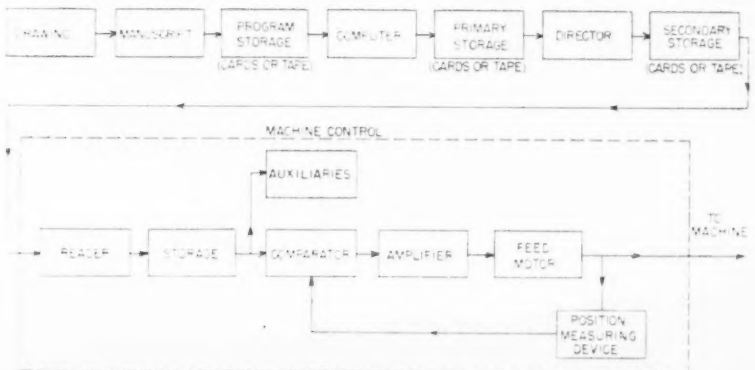


Fig. 1. Functional diagram showing relationship of components of numerical control system.

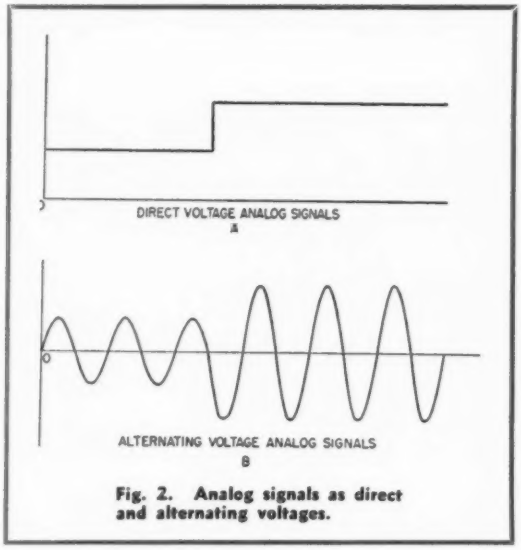


Fig. 2. Analog signals as direct and alternating voltages.

for the consideration of the basic aspects of numerical control.

Usually, though not necessarily, a drawing of the part to be produced will represent the starting point for development of the program. From this drawing, the next step is to prepare a manuscript containing a detailed description of all machine operations necessary to make the part. This description will include such items as the tooling to be used, distances to be moved, feeds, speeds, and auxiliary operations. Information on the manuscript is then transferred to the program storage medium in the form of cards or tape which for relatively simple systems may serve as the input to the machine controls.

More complicated systems, such as those for contouring, usually require that the cards or tape be fed into a computer where the tool path, including cutter offset, is calculated and recorded in the primary storage medium. Interpolation is performed in the director which generates the secondary storage medium as the input to the actual machine control shown in dotted lines in Figure 1. As part of the machine control a reader is required to extract the information from the secondary storage medium. The data must be stored while being used by the control system; this storage may be accomplished by the reader itself or by internal storage in the machine control, according to the particular system.

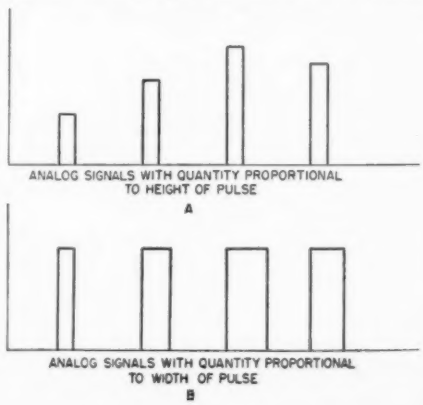
At this point, position data is fed to the closed loop systems controlling the machine motions. Since the actual machine motions are analog in nature while the data taken from the drawing is digital, a digital-to-analog conversion must, therefore, take place at some point in the programming or in the control system. The exact point at which this conversion takes place will depend on the individual system. It may occur at the last possible point, at the machine motion itself, but in some systems conversion is performed in the computer so that the data in the secondary storage is analog.

Numerical control implies the use of information in numerical or digital form as contrasted to that in analog form. Digital information implies information in the form of pulses while analog information implies continuity. The distinction is more subtle than this, however, since analog information can be and often is presented in the form of pulses. This distinction is that digital signals are concerned only with a number of states of the signal — usually two — while analog signals are concerned with the value of some characteristic of the signal. The use of digital information involves counting, while the use of analog information involves comparison of some characteristic of the signal to a standard.

To illustrate, let us assume that a voltage signal is used to represent distance. In Figure 2 both a direct voltage and an alternating voltage indicate a measure of distance in terms of voltage amplitude. For the alternating voltage, distance could have been made proportional to frequency or phase. All three indications represent analog signals. In Figure 3 we see pulse signals which are also analog in nature. In 3A the quantity of distance is proportional to the height of the pulse and, in 3B, proportional to the width of the pulse.

Digital signals usually have two states. These states may be the presence or absence of

Fig. 3. Analog signals in the form of pulses.


ANALOG SIGNALS WITH QUANTITY PROPORTIONAL TO HEIGHT OF PULSE
A
ANALOG SIGNALS WITH QUANTITY PROPORTIONAL TO WIDTH OF PULSE
B

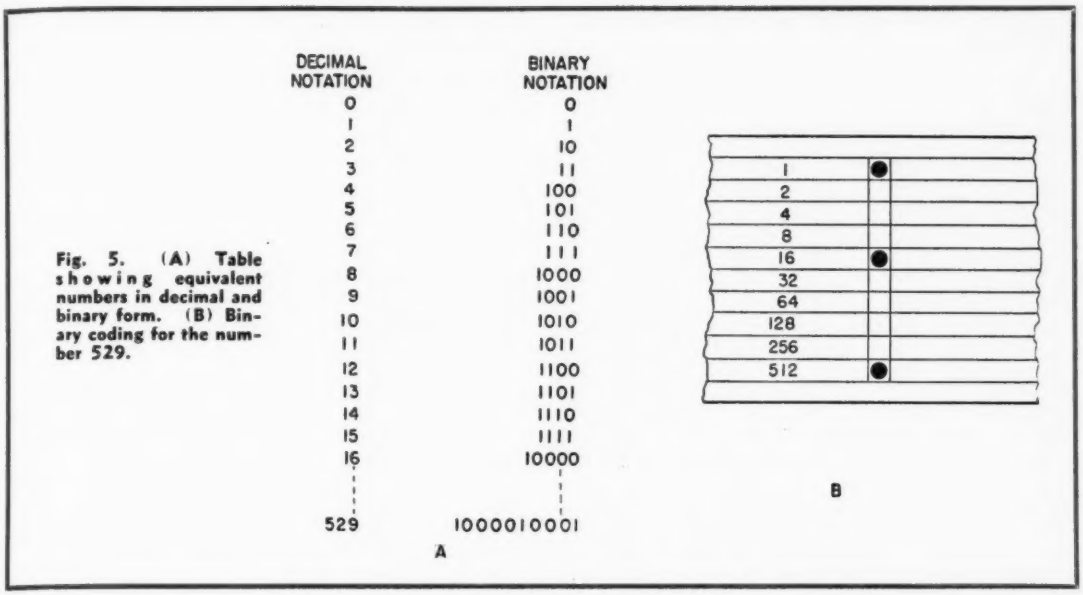


Fig. 5. (A) Table showing equivalent numbers in decimal and binary form. (B) Binary coding for the number 529.

a voltage or a voltage of one polarity as compared to a voltage of the opposite polarity. Within reasonable limits the magnitude or shape of the voltage pulse is not critical; the permissible variation depends on the components used in the particular control system. The lack of sensitivity to reasonable variations in the signal is the basis for the high inherent accuracy of digital systems.

From the standpoint of application, numerical controls for machine tools can be divided into three groups, according to function of the machine; these are controls for positioning, straight cutting, and for contouring.

Positioning control, most simple of the three types, may be used for drilling and punching operations. In this type only the end points of travel are of interest and overshoot may be tolerated. In general, it does not matter what path is taken between two holes except that the path chosen may, of course, affect the time required for travel. Too, a choice of path may be restricted by the necessity of avoiding obstructions.

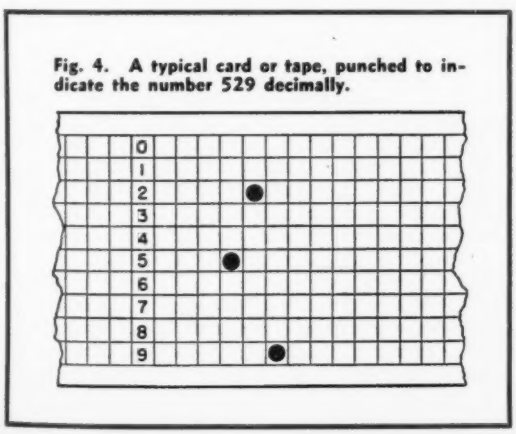


Fig. 4. A typical card or tape, punched to indicate the number 529 decimally.

The next order of complexity is represented by straight-cut control such as would be used for the turning of a stepped shaft in a lathe. In this type, position of the tool must be controlled not only at the end points, but at all points along the path of the cut. The feed rate must also be controlled and overshoot is not acceptable. More than one machine motion is usually required; however, when two or more motions are used at the same time coordination between the position controls is not required.

Contouring control, the third group, requires the programming of any tool path that can be generated by the machine motions. Usually, simultaneous position control of two axes is present including control of the feed rate. The necessity for programming the feed motions in small steps in order to follow arbitrary curves and the necessity to make correction for cutter offset makes contouring control much more complex than positioning or straight-cut control.

From still another standpoint, numerical control systems may be classified as incremental or absolute systems depending on how the position data is handled. Incremental systems specify a new position in terms of the distance and direction from the last position. Absolute systems specify each position in terms of the distance from some arbitrary base. In an incremental system, an error in programming a given position will affect all succeeding

positions. With the absolute system an error in programming is not passed on to succeeding positions. For incremental systems, power failure presents a problem in that the system may lose its memory of position, thus making it necessary to go back to some base point to pick up the program. However, the apparatus required for an incremental system is more simple and, therefore, has greater inherent economy and reliability than an absolute system.

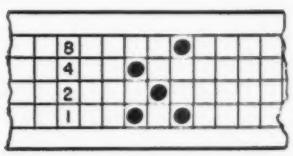
Coding of numerical information, particularly in the primary storage medium, is currently receiving much attention from machine tool builders. Drawings and other design data generally use decimal notation for all numbers except those numbers less than one which are frequently expressed as fractions. However, fractions may be easily converted to decimals; there is a considerable trend toward use of decimal rather than fractional notations on drawings.

Since decimal numbers involve the use of ten digits, from zero to nine, to represent these digits mechanically requires that the mechanism have ten possible states. In desk type calculators, this is accomplished with gears having ten teeth, each of which represents one of the decimal digits. A comparable arrangement for punched cards or tape is to assign each of the decimal digits to one of ten positions and to indicate a decimal digit by punching a hole at that precise position, as shown in Figure 4. A comparable arrangement for indicating decimal digits on magnetic tape or cards would be based on magnetization in one direction as equivalent to a punched hole, and no magnetization (or magnetization in the opposite direction) as equivalent to no punched hole. This plan is one of those used with punched card equipment; it can also be used with punched tape when ten or more rows are available. It has the advantage that the operator can easily tell what number has been punched, but also has a disadvantage in that it is inefficient in making use of the full information capacity of cards or tape and control equipment.

Cards and tape — as well as such control components as relays, electronic tubes, magnetic and semiconductor devices — lend themselves readily to a two-state type of operation. This suggests the desirability of using numerical information in the binary rather than decimal form. In the binary system only two digits, zero and one, may be arranged to represent any particular number. Figure 5A shows how identical numbers are expressed in both systems, binary and decimal. Binary coding for an arbitrarily chosen number, 529, is shown in Figure 5B. It can be seen that while ten channels are used in each of Figures 4 and 5B, the binary coding to represent 529 requires only one column while three columns are required for the decimal coding. Actually, however, the three columns of Figure 4 can be used to represent all numbers, from zero through 999, while the single column in Figure 5B has the capacity to represent the numbers from zero to 1023. As a practical disadvantage, however, it is virtually impossible for an individual to recognize by inspection the decimal equivalent of a binary number of any magnitude; in general, it is necessary to have a table of values, a pad and pencil, or a desk calculator to make this conversion. Further, when large numbers are invalued it is difficult to transcribe binary numbers without error because of the monotony experienced when working with the zeros and ones.

DECIMAL	CODED DECIMAL 8421
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
529	0101 0010 1001

A



B

Fig. 6. (A) A table of decimal equivalents for the 8421 code. (B) How 529 is punched in biquinary code.

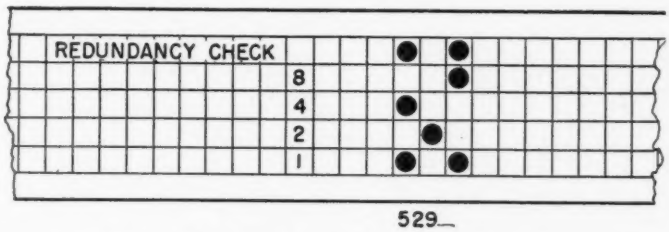


Fig. 7. Redundant information permits checking for errors. This tape is punched to give an odd number of holes in each column. An error will cause an even number of signals and bring about an indication that error is present.

As a compromise between decimal and binary coding, coded decimal notation has most of the advantages of both and few of their disadvantages. In binary notation, the minimum number of binary digits that can be used to represent "ten" is four. Accordingly there is a first inclination to use the first ten binary numbers. This is known as the 8421 code and is illustrated in Figure 6. Note that binary representations for 10 to 15 are not used. For decimal numbers larger than nine, each of the decimal digits is represented by the proper combination of four binary digits, as illustrated for the number 529 in Figure 6A. The 8421 code is weighted; that is, a definite decimal value is associated with the "ones" in each of the four positions. By adding the weights associated with the "ones" in a particular coded number, the decimal value can be obtained. Figure 6B shows that the number 529 in the 8421 code requires four rows and three columns, for a total of 12 possible hole positions. This compares with ten holes for the binary code in Figure 5B and 30 holes for the straight decimal code in Figure 4. Thus the economy of coded decimal notation approaches that of the straight binary code and considerably exceeds that of straight decimal notation. Further, the readability of weighted decimal codes is superior to that of the straight binary code and compares favorably with the straight decimal code. Decimal digits represented can be obtained easily by adding the weights associated with the holes. An added advantage is that operators quickly develop the ability to recognize on sight the value of the numbers represented.

The 8421 code is not the only code that can be used; in fact, there are over 70 million ways in which the ten decimal digits can be represented by four binary digits. Even though only 17 of this 70 million are positive weighted codes, codes which are not weighted and those employing more than four binary digits are also of significance for numerical control. Among several decimal codes, the "2421" and "excess three" codes have the property of forming the nines complement by simple inversion; this is quite helpful in arithmetic operations. The biquinary code always has a "one" in one of the first two rows and a "one" in one of the last five rows. This characteristic is most useful for error checking.

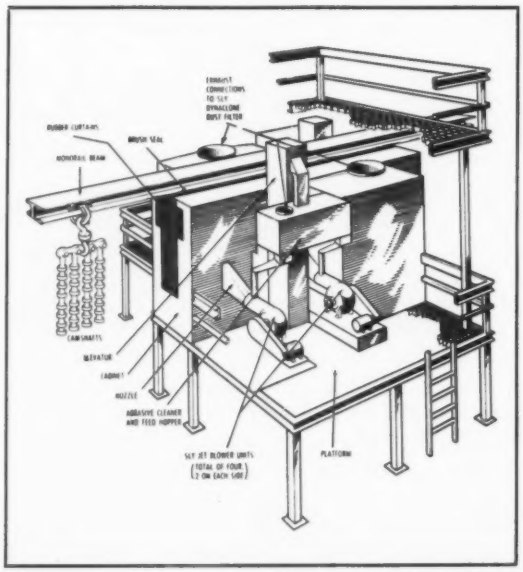
Checking for errors is made possible through the inclusion of redundant information. For example, Figure 7 shows the addition of a fifth row which is punched to insure that each column contains an odd number of holes. A single error will, therefore, result in an even number of signals per column. Through circuitry designed to register odd or even numbers of holes it is possible to indicate that an error has been made. By more elaborate use of redundant information it is possible to check more than one error and actually to locate and correct errors.

At present, many varieties of machine control systems have been built which have incorporated some of these basic ideas. The future is certain to see many other new applications of numerical control, of designs which cannot be fully anticipated now. However, it is certain that the many varieties—past, present, and future — will have a common origin in principles which are fundamental today in the numerical control of machine tools. end

Low Pressure Straight-Thru Cleaning For Shell-Molded Castings

BOTH AIRLESS BLAST CLEANING and high-pressure air-blast cleaning of sand from precision castings prior to machining tends to remove parent metal and, due to the high pressure involved, may create warping or distortion in the casting — especially in long, thin sections. High-pressure blast, in addition, requires an excessive amount of power due to the area that must be covered.

This low pressure Sly-Jet Blast system cleans 1000 to 1500 shell-molded camshaft castings per hour.



The Sly-Jet Blast is a low-pressure method designed to direct abrasive over the entire casting area to be cleaned. Therefore, cleaning action is "gentle," even with metallic abrasives. The advantages gained by the shell-mold process remain; there is little or no removal of parent metal; there is no pitting of the surface; there is no warping or distortion.

The heart of the system is a simple blower powered by an electric motor. Attached to the blower is a nozzle shaped to direct the air in the pattern required by the work. Cleaning abrasive is introduced directly into the nozzle; not through the fan.

The system offers these additional advantages:

- Power requirements are low in comparison with other methods. Availability of various size blowers makes it possible to match closely the power required.
- Nozzle patterns vary according to the type of casting to be cleaned and the area to be covered. The openings range from a circular to a rectangular shape to direct the abrasive blast accurately at any angle. Wide areas of work can be cleaned in a single run past the nozzle.
- The cleaning mechanisms can be operated continuously and the unit can, therefore, be incorporated in an existing handling system or designed as an integral part of a new system.
- In most cases the same sand used in the shell mold can be utilized effectively as the abrasive.
- Because Sly-Jet Blast is a dry process dust filters, for either continuous or intermittent operation, can be employed in the ventilating system. Thus, surrounding work areas remain dust-free.

The effectiveness of the system has been proven in use at a large automotive foundry where shell-molded camshaft castings are made. Here, from 1000 to 1500 castings, 2½" dia and 24" long, can be cleaned per hour as they travel their way to machining.

The equipment used has four blower units: two on each side, properly spaced along the cabinet and staggered up and down, as illustrated. One unit cleans the top half, a second the bottom half of one side, and the other two units act similarly to clean the other side of the casting. Full use of abrasive cleaning action is made by the incorporation of curved corrugated steel baffle plates at each blower unit station to guide rebound of the abrasive back against the castings.

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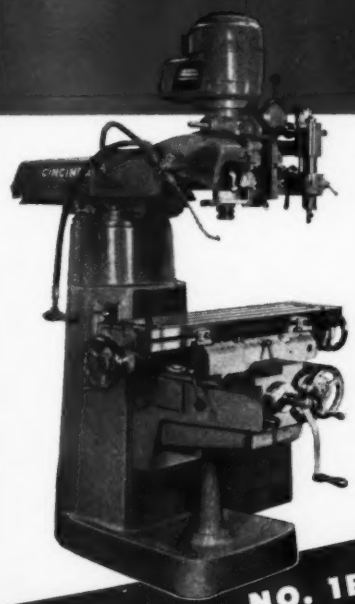

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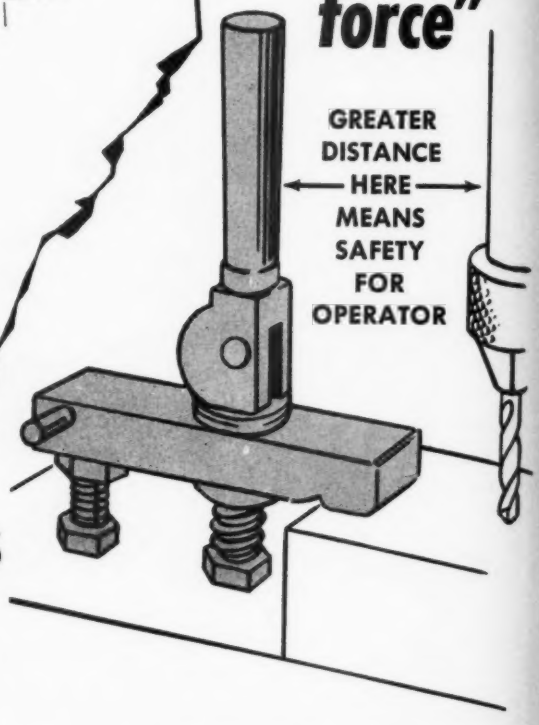

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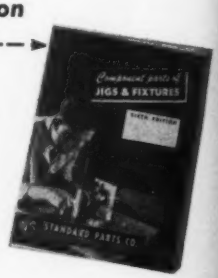

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A6	A24	A42	A60	B3	B21	B39	B67	B75	F5
A7	A25	A43	A61	B4	B22	B40	B68	B76	F6
A8	A26	A44	A62	B5	B23	B41	B69	B77	F7
A9	A27	A45	A63	B6	B24	B42	B60	B78	F8
A10	A28	A46	A64	B7	B25	B43	B61	C1	F9
A11	A29	A47	A65	B8	B26	B44	B62	C2	F10
A12	A30	A48	A66	B9	B27	B45	B63	C3	F11
A13	A31	A49	A67	B10	B28	B46	B64	D4	
A14	A32	A50	A68	B11	B29	B47	B65	C5	
A15	A33	A51	A69	B12	B30	B48	B66	C6	
A16	A34	A52	A70	B13	B31	B49	B67	C7	
A17	A35	A53	A71	B14	B32	B50	B68	C8	
A18	A36	A54	A72	B15	B33	B51	B69	C9	

Which article in this issue was of most interest to you? _____

_____

THESE INFORM-A-GRAM CARDS are for the convenience of *TOOLING and PRODUCTION* readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured — all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

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INFORM-A-GRAM AUGUST, 1956 ISSUE

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COMPANY ADDRESS _____

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3	24	43	61	110	122	1302	1023	1582	1652	1004	1741	1002	1851
4	25	44	62	111	124	1303	1031	1583	1653	1701	1742	1003	1852
5	26	46	63	113	126	1304	1032	1591	1654	1702	1743	1004	1853
7	27	46	64	116	126	1401	1033	1592	1655	1703	1744	1005	
8	28	47	66	117	127	1402	1034	1593	1656	1704	1751	1011	
9	29	48	66	118	128	1403	1041	1601	1661	1705	1752	1012	
10	31	49	67	119	141	1411	1042	1611	1662	1711	1753	1013	
11	32	51	68	120	142	1402	1051	1612	1663	1712	1761	1021	
12	33	53	69	121	143	1403	1052	1613	1671	1713	1762	1022	
13	34	55	100	122	144	1404	1053	1614	1672	1721	1771	1023	
15	35	56	101	123	145	1501	1061	1621	1673	1722	1772	1031	
16	36	58	102	124	147	1502	1062	1622	1674	1723	1773	1032	
17	37	59	103	125	157	1511	1071	1631	1681	1724	1781	1033	
18	38	60	105	126	158	1512	1072	1632	1682	1725	1782	1034	
19	39	61	106	127	1291	1513	1073	1633	1683	1731	1791	1041	
21	40	62	107	128	1292	1514	1074	1641	1691	1732	1792	1042	

EDITORIAL ITEMS

A1	A19	A37	A55	A73	B10	B34	B62	B79	D1
A2	A20	A38	A56	A74	B17	B35	B63	B71	F1
A3	A21	A39	A57	A75	B18	B36	B64	B72	F2
A4	A22	A40	A58	B1	B19	B37	B65	B73	F3
A5	A23	A41	A59	B2	B20	B38	B66	B74	F4
A6	A24	A42	A60	B3	B21	B39	B67	B75	F5
A7	A25	A43	A61	B4	B22	B40	B68	B76	F6
A8	A26	A44	A62	B5	B23	B41	B69	B77	F7
A9	A27	A45	A63	B6	B24	B42	B60	B78	F8
A10	A28	A46	A64	B7	B25	B43	B61	C1	F9
A11	A29	A47	A65	B8	B26	B44	B62	C2	F10
A12	A30	A48	A66	B9	B27	B45	B63	C3	F11
A13	A31	A49	A67	B10	B28	B46	B64	C4	
A14	A32	A50	A68	B11	B29	B47	B65	C5	
A15	A33	A51	A69	B12	B30	B48	B66	C6	
A16	A34	A52	A70	B13	B31	B49	B67	C7	
A17	A35	A53	A71	B14	B32	B50	B68	C8	
A18	A36	A54	A72	B15	B33	B51	B69	C9	

Which article in this issue was of most interest to you? _____

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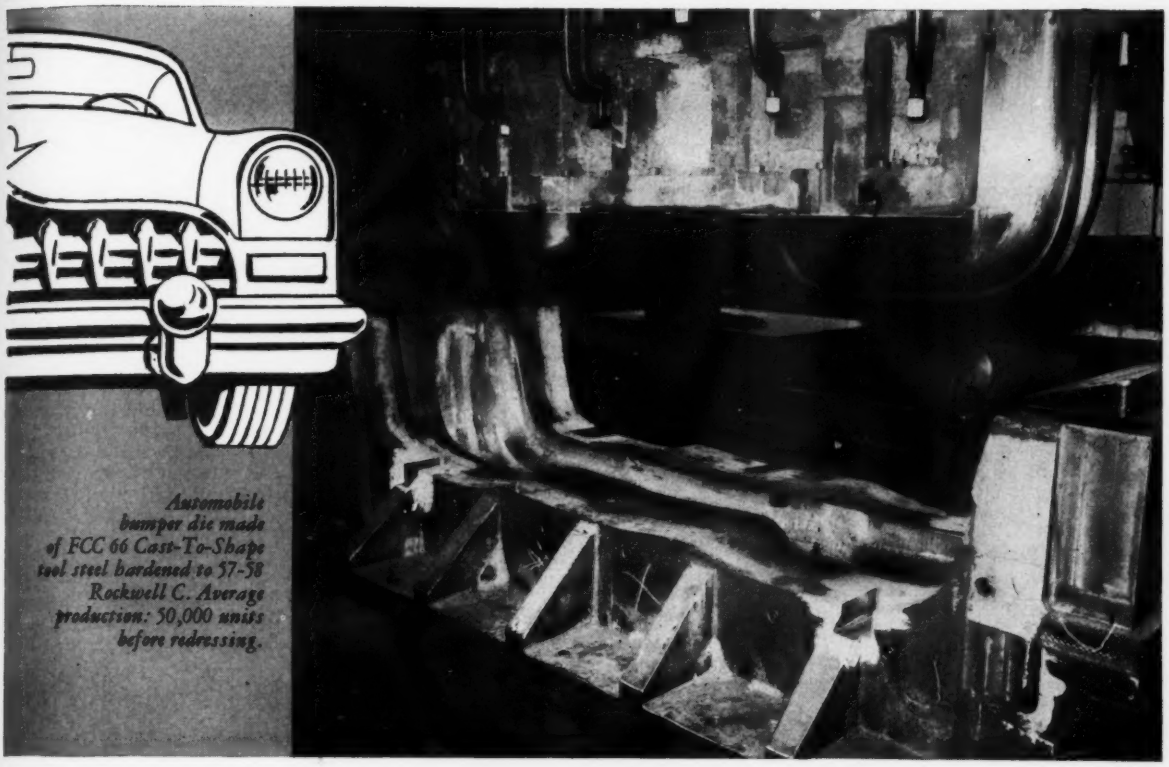
1975 LEE ROAD

CLEVELAND 18, OHIO

Try this money-saving method that auto-makers use



Automobile bumper die made of FCC 66 Cast-To-Shape tool steel hardened to 57-58 Rockwell C. Average production: 50,000 units before redressing.

A-L CAST-TO-SHAPE TOOL STEELS

Auto makers, too, are included in the long list of manufacturers enjoying the advantages and economies of A-L Cast-To-Shape tool steels. By this modern, money-saving method of tool and die making, it is possible to cast even intricate shapes to within an eighth of an inch of finished size. The savings in time and material over that of machining from solid stock are readily apparent.

A-L Cast-To-Shape tool steels are offered in a variety of grades, and are electrically melted to precise laboratory standards. They are remarkably resistant to abrasion and possess great compressive strength. In many cases, they out-perform tools and dies made from solid bars and forgings.

Remember, with A-L Cast-To-Shape tool steels, you buy less steel originally, and you have less machining to do for finish. Ask your A-L representative about them TODAY . . . or write *Allegheny Ludlum Steel Corporation, Forging and Casting Division, Wanda and Jarvis Avenues, Detroit 20, Michigan.*

SEND FOR THIS NEW CATALOG
"FORGING AND CASTING PRODUCTS"

Contains the latest information on FCC Air Hardening, Oil Hardening and other Cast-To-Shape Tool Steel Specialties that can save you time and money . . . also Composite Die Sections and Smooth Hammered Forgings in a wide range of tool and stainless steels. *Don't wait—get your copy NOW.*

Write Today

ADDRESS DEPT. TP-80

For complete MODERN Tooling, call

Allegheny Ludlum

AL® FINE TOOL STEELS SINCE 1854

WSW 6078

CIRCLE INFORM-A-GRAM KEY NO. 91

Machining Honeycomb Structures

Machining of stainless steel honeycomb structures has now become possible through a newly developed hot-melt compound developed at Furane Plastics Incorporated of Los Angeles. This development has been of the utmost importance to aircraft and guided missile manufacturers who are now using large quantities of stainless steel honeycomb.

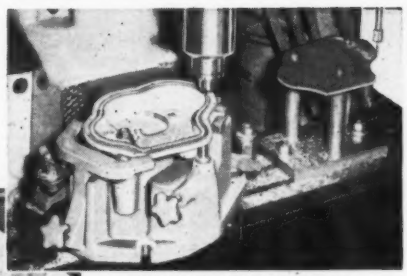
Without proper support during machining, the structure will collapse, tear, or be virtually impossible to maintain accurate dimensions. With Hot Melt H-883-A and its extremely low linear shrinkage, the cells of the stainless steel honeycomb are maintained during the machining operation — not tending to collapse or fray — a problem which occurs when using waxes or similar space fillers.

In practice, Hot-Melt H-883-A is melted at a temperature near 200°F in stainless or aluminum pans and the honeycomb inserted. After cooling and after machining, the compound may be melted from the honeycomb and hot water used for final cleaning.

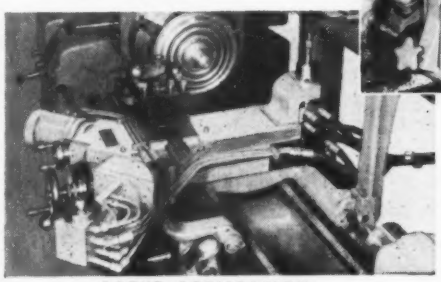
SPECIFIED AS ORIGINAL EQUIPMENT BY LEADING MANUFACTURERS OF MACHINE TOOLS

TURCHAN EQUIPMENT IS ADAPTABLE TO MOST MACHINE TOOLS *without* INTERFERING WITH MANUAL OPERATION

Modernize your standard machine tools with Turchan hydraulic tracer attachments. Enjoy the extra profits possible with precision automatic production equipment.



MILLING APPLICATION



LATHE APPLICATION

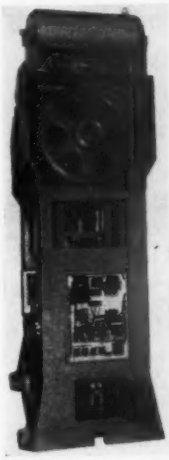
Produce at greater speed, a higher degree of accuracy without frequent "miking" and reduce rejects. Any machine operator can handle intricate profile or contouring jobs with Turchan tracers.

New literature is now available on Turchan products. Turchan field engineers are happy to talk to you. Write or call today. There is no obligation.

Turchan FOLLOWER MACHINE CO.

CIRCLE INFORM-A-GRAM KEY NO. 92

New Type Press Saves Floor Space

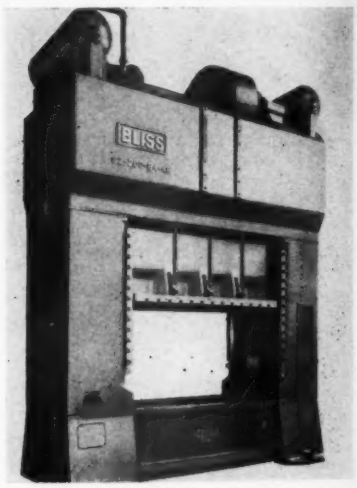


A number of these "enclosed" presses which require a minimum amount of floor space are already in use in Industry.

The gear drive arrangement is different in that it is incorporated in a left-to-right manner; in preference to the front-to-back design. This gear setup lends itself to a symmetric crown box having a compact tidy appearance. Twin intermediate shafts are used for the drive, permitting the clutch and the motor to be mounted in between.

The massive uprights are cast from Meehanite and house the auxiliary equipment. Equipment and control devices are accessible through doors or panels.

Included among the control devices is the Bliss Automation Control — a precise electromechanical rotary switch used for the purpose of automatic control by programming.



Other advantages found in these presses are thorough lubrication by automatically metered oil, and the many benefits to be derived from the use of JIC standards throughout the electrical and hydraulic systems.

These presses, being manufactured by the E. W. Bliss Company, are made in capacities from 150 to 750 tons.

BUY U. S. SAVINGS BONDS — TODAY

Made with MAGNESIUM

DOW

A FEW POUNDS make a big difference when jigs have to be moved manually several times an hour.

MAGNESIUM FOR LOW-COST TOOLING

Lightweight magnesium tooling plate costs less to buy, less to fabricate and less to use

• **COSTS LESS TO BUY**—Jigs and fixtures made with magnesium cost you less in every way. Magnesium tooling plate costs less than commonly used lightweight tooling materials.

• **COSTS LESS TO FABRICATE**—Magnesium jigs and fixtures are easy and economical to build, too. The reason is that magnesium tooling plate is easy to machine, easy to weld. It has guaranteed flatness, excellent dimensional stability and freedom from porosity.

• **COSTS LESS TO USE**—Handling costs are also lower when you use magnesium tooling plate. Magnesium weighs one fourth as much as steel and only two thirds the weight of aluminum. By making your jigs and fixtures with lightweight magnesium you'll increase worker efficiency and reduce lost-time injuries.

For more information about magnesium tooling plate contact your nearest supplier of Dow magnesium, or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 371AA.

AVAILABLE FROM STOCK AT: Copper and Brass Sales, Inc., Detroit, Mich. • Fullerton Steel and Wire Company, Chicago, Ill. • Hubbell Metals Inc., St. Louis, Mo. • A. R. Purdy Co., Inc., Lyndhurst, N. J. • Reliance Magnesium Company, Los Angeles, Calif. • Vinson Steel and Aluminum Co., Dallas, Texas.

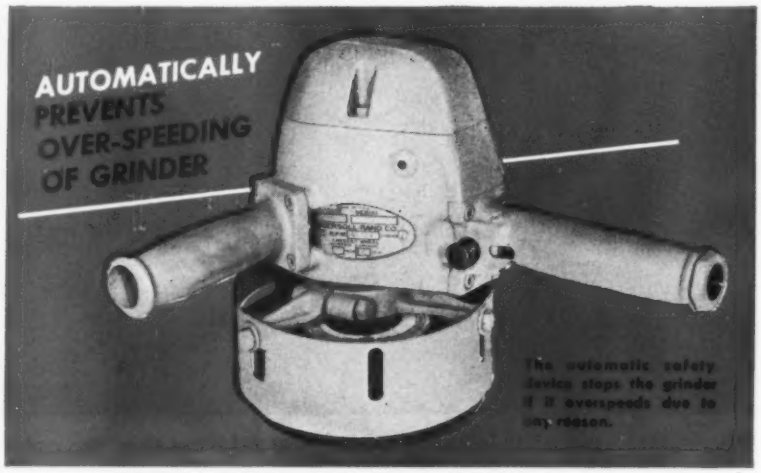
you can depend on DOW MAGNESIUM DOW

CIRCLE INFORM-A-GRAM KEY NO. 93

NEW

THE ONLY

SURFACE GRINDER with a POSITIVE SAFETY SHUT-OFF!


AUTOMATICALLY PREVENTS OVER-SPEEDING OF GRINDER
The automatic safety device stops the grinder if it overspeeds due to any reason.

PLUS THESE OTHER COST-SAVING OPERATING ADVANTAGES:

- Handles can be set at 90° or 120° for close corner work and operator comfort . . . another Ingersoll-Rand FIRST!
- A responsive governor insures maximum cutting speed and minimum air consumption regardless of load.
- Single point lubrication, double-sealed wheel bearings, large oil reservoir for long life, low cost operation.
- Top of tool is flat for easy pressure application.
- Available in 2 Models and 4 speeds as follows:

  Speeds: 3100—4100—4500—and 6000 rpm.

  Size 41F with push-locking throttle for constant operation.

  Size 41FX with self-closing, safety type throttle.

Ask for a demonstration of this new safety grinder in your shop.

8-343

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 94

THE POWER TO GO, by Merrill Denison. Published by Doubleday & Company, Inc., 575 Madison Ave., New York 22, N. Y., 1956. 324 pages, $5.

Anyone who likes to drive a car will be fascinated by this history of the automobile, from tiller to power steering. As the author recalls, "The automobile was never invented . . . it just grew." Since the turn of the century and the one-cylinder Olds and Model T Ford, the auto industry has grown at an incredible pace until today in the U. S. alone nearly 6,250,000,000 horsepower-on-wheels is in use.

Besides following the path of the auto itself, the informative nontechnical book paces the inside story of our giant-size automobile industry—an industry which has changed the entire cultural and economic pattern of our country.

MINUTES OF SYMPOSIUM ON CERAMIC CUTTING TOOLS, publication PB 111757. Available from Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. 127 pages, $3.25.

Minutes of a symposium of experts on ceramic cutting tools, held at the Army's Rodman Laboratory, Watertown Arsenal, are published in this volume. It contains these papers: "Processing Ceramics," Prof. F. H. Norton, Massachusetts Institute of Technology; "Properties and Uses of Ceramic Tools," Dr. E. Ryshkewitch, Kearfott Co., Inc.; "Notes on Ceramic Tools," W. M. Wheildon, Norton Co.; "Molybdenum Boride Cutting Tool," E. DiCesare, Watertown Arsenal; "Preparing Ceramic Tool Material," B. Bovarnick, Watertown Arsenal; and "Machining Studies," W. B. Kennedy, Watertown Arsenal.

BUSINESS INFORMATION, by Marian C. Manley. Published by Harper & Brothers, 49 E. 33 St., New York 16, N. Y., 1955. 265 pages, $5.

The importance of accurate business information can mean the difference between success and failure in the business world. The growth of research and scientific methods has led to a corresponding growth of specialized publications and services. This book tells where to look for business information by offering a survey of these business tools.

The book is a product of the author's 30 years experience in assembling, organizing and promoting the

effective use of data available in business development. It is divided into three parts: a discussion of the use of the resources available; a definitive bibliography covering business publications and specialized tools such as trade association reports, government studies, trade papers, and industrial directories; and a complete and carefully cross-referenced index.

ASME HANDBOOK: ENGINEERING TABLES, edited by Jesse Huckert, sponsored by the Metals Engineering Handbook Board of the American Society of Mechanical Engineers. Published by McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 36, N. Y., 1956. 704 pages, $12.

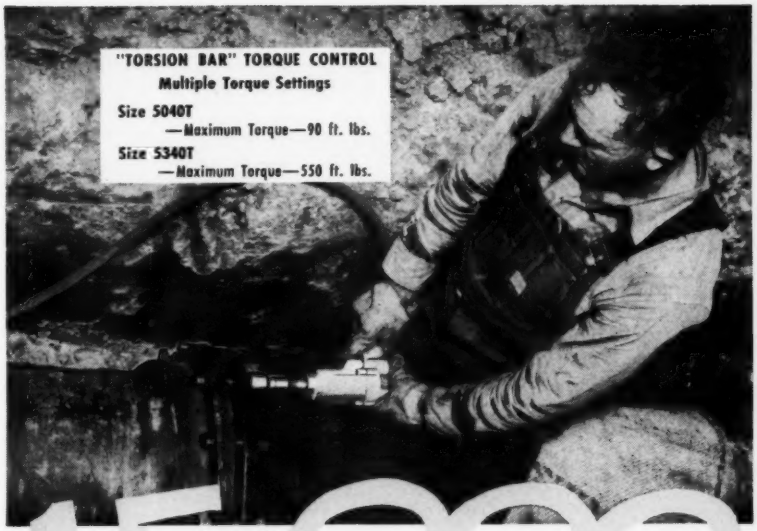
In this reference book, one of the four volumes comprising the ASME Handbook, engineers and designers have available many tables of recognized design standards of the type not commonly found in handbooks. Typical of these are the table of involute functions, methods for finding loads on ball bearings, and information on bars and tubes suitable for reworking into gears, levers, shafts, or screws. Tables readily found elsewhere are not included because of space limitations.

The book is arranged in 15 sections, grouping together tables which apply to the design of specific parts. It covers such subjects as bar stock and shafting; bearings; spur, helical and herringbone, bevel, and worm gears; cylindrical fits; keys and keyseating; bolts, springs; aircraft and mechanical tubing; serrations and splines; electrical motors, and gaskets.

The editor, Jesse Huckert, is Professor of Mechanical Engineering at The Ohio State University.

AIRCRAFT PRODUCTION METHODS, by Gordon B. Ashmead. Published by Chilton Company, Chestnut & 56 Sts., Philadelphia 39, Pa., 1956. 293 pages, $7.50.

A complete and comprehensive collection of aircraft methods in book form, the book takes the reader on a step by step, personally conducted tour through a number of U. S. aircraft companies. It begins with the master plaster pattern and goes from there to the foundry, where dies to form metal are made. From there to the forming machines, the drop hammer, the stretch press, the reader sees sheet metal stock turned into aircraft parts. Advanced methods of heat treatment are covered as well as the way surfaces are prepared to withstand the elements. Up to the minute use of optical tooling and closed-circuit TV carry the book to final assembly.



15,000

¾" bolts uniformly tightened to 60 ft. lbs.

TORSION BAR

with new Ingersoll-Rand

Torque Control IMPACTOOL

PROBLEM:	Assembly of 1390 mechanical pipe joints involved over 15,000 ¾" bolts. The problem was to speed assembly, remove guesswork and assure proper tightness of all joints.
AIR ENGINEERING SOLUTION:	A new Ingersoll-Rand Size 5040T Torsion Bar Torque Control Impactool, preset to deliver 60 ft. lbs., was put on the job.
RESULT:	The Torque Control Impactool automatically shut off at the preset Torque . all guesswork was eliminated . . uniform joint tightness was produced . . . an average of 10 minutes per joint was saved . . . smaller bell holes were required due to compact size of the 5040T this one tool produced an extra profit of $404.25 on this job.

You can put these new "Torsion Bar" Torque Control Impactools on your nut running jobs and reap these benefits: Positive Torque Control . . . Simple Torque Setting . . . Setting remains constant . . . No pressure regulators needed . . . No operator training.

Write or phone for a free demonstration of this revolutionary fastening development.

Ingersoll-Rand

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CIRCLE INFORM-A-GRAM KEY NO. 95

IT'S A **BETTER MOLD**
IT COST **30% LESS**
CAST TO SHAPE IN
DARWIN & MILNER PRK·33
TOOL STEEL

Large ring is 30" in diameter, 2¾" thick

• The S. K. Wellman Company, Bedford, Ohio, leading maker of all metal clutch plates, facings and brake linings, had traditionally bought tool steel forgings for these mold parts until they tried PRK-33 Air Hardening Cobalt, High Carbon, High Chrome castings.

The results were completely satisfactory. The cost was 30% less than forgings. The castings were closer to final dimensions than the forgings and were much easier to machine.

Because PRK-33 is a higher grade steel than that previously used in the molds, runs between grinds were at least equal and often longer.

If you use steel molds, dies or tools—call or write now! We can advise you how "Cast to Shape" may be able to offer you a substantial savings in your tooling.

Complete line of highest grade Tool Steels, including PRK-33, DARWIN No. 1, NEOR, MINEOR, OHT, "MT6" and various grades of Hot Work Specialty Steels. Furnished in Bar Stock, Billet and Sand Casting, Drill Rod, Flat Ground Stock and Tool Bits. Bulletin on Request.

DARWIN & MILNER Inc.
highest grade tool steels
2345 ST. CLAIR AVENUE ★ CLEVELAND 14, OHIO
• 1610 W. FIRST AVENUE • COLUMBUS, OHIO •

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CIRCLE INFORM-A-GRAM KEY NO. 96

S. A. E. Plans Merge of Air and Auto Drafting Standards

Publication of a drafting manual combining the best and most widely accepted drafting practices in the aeronautic and automotive industries is to be undertaken by the Society of Automotive Engineers.

Because drafting is the means by which engineers record their creative ideas and communicate information to the factory which manufactures them into reality, the S.A.E. hopes the manual will give clearer and less costly communications between engineers.

Some of the projects on the group's joint aero-auto drawing standards committee agenda will have far-reaching effects. They include:

1. Improvement of geometric and positional tolerancing standards.
2. Simplification of drafting practices.
3. Investigation of the trend to eliminate specifying how to process a product on engineering drawings, to allow maximum flexibility in the use of methods and equipment during manufacture.
4. Encouragement in the use of decimal dimensioning.
5. Standardization in the method of specifying screw threads, with particular emphasis on special, modified, coated or plated threads, and those having special lengths of engagement.
6. Development of new drafting techniques for use in preparing drawings that are intended to be reduced in size.
7. Development of a standard method of specifying how to control free state variations in the shape of sheet metal parts.

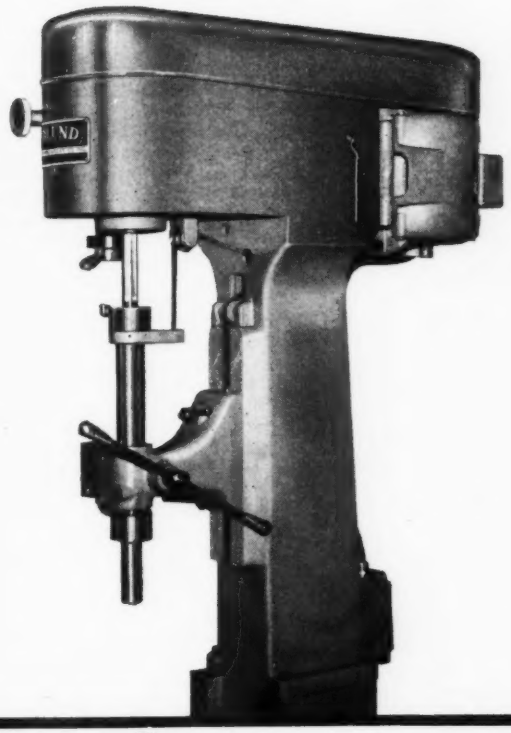
The Society has been actively serving industry on drafting standardization for many years. In 1940 and 1946, manuals on automotive and aeronautical standards, respectively, were prepared.

In 1950 the aero-auto committees prepared a common standard on abbreviations of terms used on engineering drawings. This worked out so well that in 1953 a joint sub-committee undertook the more ambitious task of writing a common standard of dimensioning and tolerancing. Completed in 1954, this standard immediately became this country's most authoritative work on the subject.

The latest practices established by the joint S.A.E. efforts probably will be important factors in the preparation of military drafting standards and in the publication of an American drafting standard manual by the American Standards Association.

EDLUND MODEL 2FV

NEW! CONTINUOUS PRODUCTION DRIVE

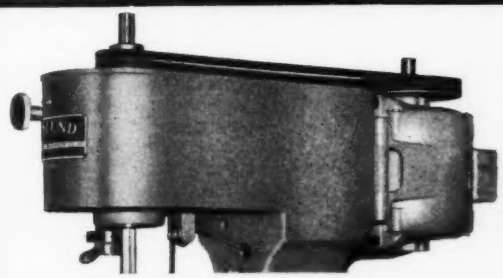


- **Lower Original Cost**
- **Economical Maintenance**
- **Positive Control over Production Speeds**

Now, a new type drive is offered for the EDLUND Model 2F—America's most popular drilling machine.

Designed for those companies having long production runs at either one or several pre-selected speeds, this new drive offers lower initial cost.

This machine employs the same rugged construction and modern features available on the Model 2F machine, with the exception of the infinitely variable speed drive. You can easily convert to other speeds or to the infinitely variable speed drive whenever your production requirements change. Write for Bulletin 140V for complete data and specifications.

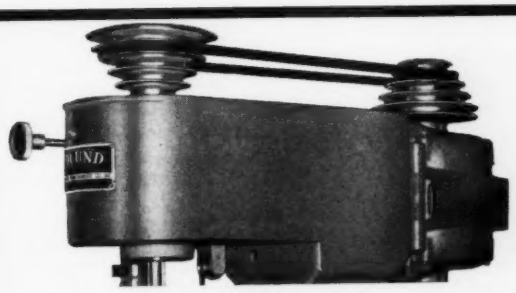


2FV-1 Single Step Sheave

For plants requiring one continuous speed for drilling and/or tapping operation.

Available, in any specified single speed. (Back Gear gives second speed with 4:1 speed reduction)

(View With Guard Removed)



2FV-5 Five Step Sheave

For production set-ups that require several predetermined speeds.

Choice of motor plus 5-step sheave and Back Gear provide ranges between 60 and 4800 RPM.

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Contact the EDLUND Representative in your area for:

DRILLING AND TAPPING MACHINES

Capacities — through 1½"

- Hand Feed Units
- Cam Feed Units
- Motor Spindle
- Cone Pulley Drives
- Variable Speed Drives

EDLUND MACHINERY COMPANY

Cortland, New York

Division of Harsco Corporation

CIRCLE INFORM-A-GRAM KEY NO. 97

Why TECUMSEH Compressor Crankcases Are MICROHONED

"On Tecumseh compressors, we Microhone the piston bores. ***This gives us a running seal between pistons and bores which prevents gas leakage and eliminates the need for piston rings!*** Believe me, it takes a real combination of accuracy and functional surface finish to get results like that . . . and only Microhoning has given us that combination!"

(Tecumseh Products Company, Tecumseh, Michigan, is the world's largest producer of refrigeration compressors. Precision engineered and processed these units are hermetically sealed before leaving the factory.)

OTHER JOB DATA:

MATERIAL	Cast iron
PRECEDING OPERATION	Diamond finish-bore
MICROHONING OPERATIONS	One
STOCK REMOVAL	.0007" to .001"
FINISH	10 Microinches
TOLERANCES	
Diametric	.0003"
Roundness	.00015"
Straightness (Taper)	.00015"
HONING CYCLE	18 seconds, including fixture indexing time

"Here's our twin cylinder crankcase. The two piston bores in each case are opposite one another in the vertical plane, but they lie in two different horizontal planes. We simultaneously Microhone both bores in each crankcase, using a horizontal type machine with two opposing spindles."

"Although all of our crankcases are similar in design, the bores vary in diameter—1.312", 1.375", 1.500" and 1.625". Two fixtures on a two-position rotary indexing table let us Microhone one crankcase while another is being loaded. To run different bore diameters we just change the tools and gage rings. Switchover time is about five minutes."

Let a Micromatic Field Engineer show you how Microhoning will give you better functional finishes, closer tolerances and higher production.

☐ *Please have a Micromatic Field Engineer contact us.*
☐ *Please send literature and case histories on Microhoning.*

NAME_____

TITLE_____

COMPANY_____

CITY_____ ZONE____ STATE_____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 98

Engineers Told To

BEGIN LOCALLY TO CURB ENGINEERING SHORTAGE

Education held the spotlight at two important sessions of the American Society of Mechanical Engineers' recent meeting in Cleveland. Among the spokesmen: ASME President Joseph W. Barker; Louis G. Gitzendanner, Manager of Mechanical Systems Engineering at General Electric's General Engineering Laboratory; and Erik Halvarson, Instructional Department Section Head at the General Motors Institute.

In soliciting the interest and aid of his fellow engineers, Dr. Barker called upon the organization's 41,000 members to take measures on the community level to solve educational deficiencies which "lie at the base of America's shortage of skill technicians."

A large part of the responsibility for the engineering shortage is traceable to the schools, Dr. Barker maintains. Insufficient background in science and mathematics in high schools, because of a decrease in the number of qualified teachers of these subjects, "makes itself felt when the student reaches college age." One result is that "a large percentage of college students must waste their time in courses they should have mastered before they ever applied for college admission."

The ASME leader emphasized that there is no national answer to the educational problem. "It is going to have to be worked out locally," he asserted, "by people like yourself, in community after community across the nation."

"Put at the disposal of your communities the one thing that you alone can give: the priceless advantage of your special training and experience in the engineering profession . . . do it by serving on official and semi-official community organizations . . . by volunteer work in the educational system of your community . . . by taking an active interest in the way your children are being taught."

Not all companies are now feeling the force of the engineering shortage, Dr. Barker commented when interviewed. As a result they shrug off the comparative statistics. "They had better act now to counteract the shortage," he said, "before they feel the full impact and before their business is impaired from it."

Those firms who already realize the seriousness of the situation, said Dr. Barker and a number of his colleagues, are taking great care to place the engineers on projects absolutely requiring their skill, and assigning lesser tasks to other personnel.

Give engineering students actual industrial problems instead of wholly academic problems in college courses, to make them immediately valuable in industry after graduation, argued Louis G. Gitzendanner when speaking at a special education panel.

In a typical academic problem, he said, the method to be used is indicated by the subject matter currently being taught. The assumptions, if any, are all stated, with the result that there is little opportunity for using imagination and ingenuity. He suggested that one of the more important concepts of instruction would be the consideration of proportions, which can give an "artists' conception" of a design. Past successful or even unsuccessful designs can be of tremendous help in creating new designs, Gitzendanner believes.

"Engineers must look at problems thoroughly," said Erik Halvarson. To do this, "he must have 1) original thinking, 2) an understanding of the fundamental principles, and 3) ability to weigh and relate considerations." To prepare for this, undergraduate schools must "aim and get flexibility of approach to problems."

G.E. Switches Name of Carboloy Department

The name of General Electric's Carboloy Department has been changed to the Metallurgical Products Department, to reflect the company's greater emphasis on specialty metals development and manufacture. Department headquarters remain in Detroit.

The company expects continued growth in this field, according to K. R. Beardslee, department general manager.

The two major products of the department are Carboloy cemented carbides and Alnico permanent magnets. Present plans call for doubling these businesses during the next 10 years.

The Metallurgical Products Department also has pilot lines for producing man-made diamonds and vacuum melted metals.

A new process that will take 98% of the tin out of more than 10 billion cans has been announced by American Can Co. The development, known as margin plating, consists of tinplating only the narrow margins of the steel plate that form the soldered side seams of the cans. The rest of the can is made of enameled steel plate.

How MICROHONING Makes a Gas-Tight Running Seal Without Piston Rings

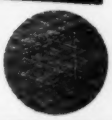
A leak-free, running seal between bores and pistons—without the use of rings—is possible only when the processing method generates diametric and geometric accuracy and the required functional surface finish. These characteristics are simultaneously obtained by the Microhoning process. Here's how:

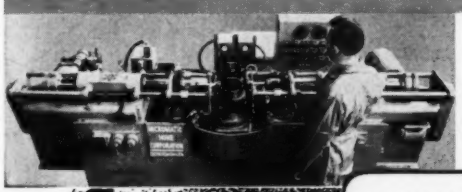
1 The sticks of abrasives in the tool form an abrasive "cylinder" and are fed out radially with equal pressure in all directions. High spots and tight areas in the bore are abraded first.

2 The long abrasive sticks cut only on the crests of wavy or snaky surfaces until the bore has the same diameter throughout its full length.

3 The combination of tool motion (rotation and reciprocation) and feed pressure fractures the abrasive grits that have become dull, and new sharp edges are formed; the clean constant cutting action of every stroke on the full bore length consistently generates the desired surface finish.

One of the exclusive advantages of Microhoning is its ability to produce whatever functional surface characteristics are required for maximum product performance. Microhoning's cross-hatch pattern, with its myriad of minute intersecting "valleys," furnishes an excellent surface for retention of lubrication.





"Here's one of two Micromatic Model 523-2 machines used on the compressor crankcase job. Tecumseh uses a total of 18 Microhoning machines on other vital processing operations."

The principles and applications of Microhoning are thoroughly explained in an informative 16mm., 30-minute sound movie, "Progress in Precision." We'll be glad to reserve a print for your use. Just tell us on the coupon the date you'd like to see it.

☐ Please send me "Progress in Precision" in time for showing on _____(date)

☐ Please send literature on Microhoning. I am interested in the following application: _____

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TITLE _____

COMPANY _____

CITY _____ ZONE _____ STATE _____

MICROMATIC HONE CORP.

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CIRCLE INFORM-A-GRAM KEY NO. 99

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CIRCLE INFORM-A-GRAM KEY NO. 100

Dodge President Shows Trends For

10-Million Auto Market By 1960s

Record-breaking sales of automobiles in 1955 represented the "first clear tip-off" on the real size of the demand for cars in this country, William C. Newberg, president of the Dodge Division of Chrysler Corporation recently told the Seattle Chamber of Commerce.

Chances are "very good," he added, that the 8-million car market of last year will be "nothing much to shout about" from 1960 on, with a 10-million market likely by 1965 or shortly thereafter.

While acknowledging that passenger car production and sales figures for the current year are below the 1955 level, Newberg maintains that in 1955 we got the first real look at the real size of the demand for automobiles under conditions that might be called normal.

Newberg cautions that there may not be another year as big as 1955 for another few years, "but the chances are very good that from 1960 on we will consider an 8-million car market as nothing special."

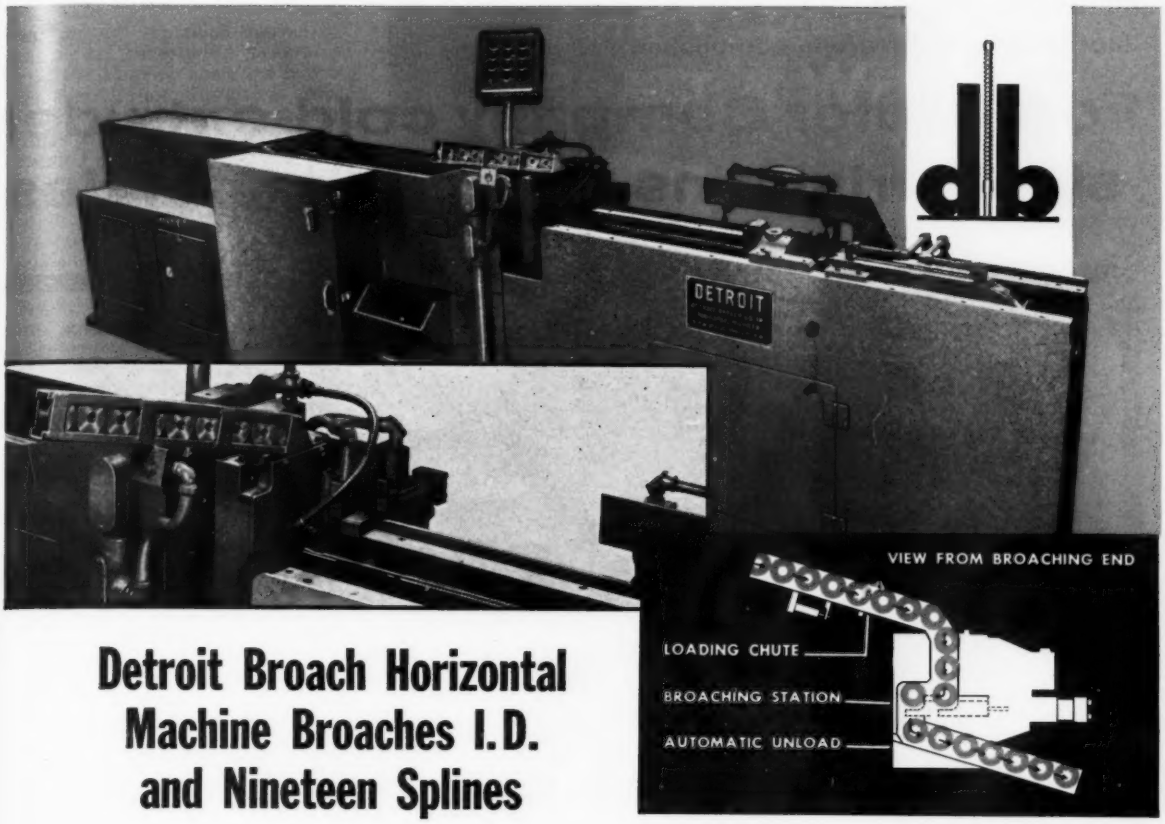
Several trends support the Dodge president's views. He cites the nation's population growth as one example, pointing out that it is not only growing at the rate of almost 3-million persons a year, but also to the fact that the greatest expansion is being enjoyed by suburban areas.

"Any way you figure it, these facts mean good business ahead for Detroit," Newberg says. Suburban living calls for two cars in the family and recent studies show that between August 1953 and August 1955 the number of multiple-car families grew from 3½-million to over 6-million — a 70% increase.

The most optimistic estimates of the future automobile market may even turn out to be low, Newberg said at Seattle. "What would happen, for instance, if the country's engineers should come up with a completely new kind of engine — smaller, quieter, more responsive and more efficient than anything we now have? A development of this kind would make every car on the road obsolete, and every company in the business would be working under forced draft to meet the demand."

The recent successful cross-country trip made by a Chrysler Corporation car powered by an experimental gas-turbine engine — an advance design reportedly 10 years from production — could start such a development race.

. . . Continued on Next Page



Detroit Broach Horizontal Machine Broaches I.D. and Nineteen Splines

- ***Sizes I.D. and holds it concentric with Spline P.D.***
- ***Completely automatic 8-second cycle***

This 3-ton, 36-inch stroke Detroit Horizontal Broaching Machine is inexpensive, fast, and offers automatic operation, tool handling and work ejection. While manual chute loading is illustrated, optional automatic loading is easily accomplished.

During its 8-second automatic cycle the machine accurately sizes the I.D. and broaches 19 precision internal splines, keeping them 100% concentric with the I.D. Thus, subsequent operations are performed more easily and economically because of simplified work location and improved accuracy.

This simplicity with high production is typical of Detroit Broach & Machine Company engineering. Detroit builds every size and type of broaching machine, and will automate and tool them to fit your needs. Discuss *your* production problem with a Detroit field engineer, or send us details . . . today.

THE CYCLE

1. Part drops through chute into "LOAD" position
2. Loader pushes part into broaching position
3. Loading signals automatic tool handling mechanism to move broach in to engage broach puller
4. Broach is pulled through work to end of pre-set stroke
5. Loader returns, broached part drops into unloading chute, next part drops into "LOAD" position
6. Returned loader signals machine to return broach to tool handling mechanism.
7. Machine slide stops, tool handling mechanism returns broach to "START" position
8. Cycle repeats . . . EVERY 8 SECONDS!

DETROIT BROACH & MACHINE COMPANY

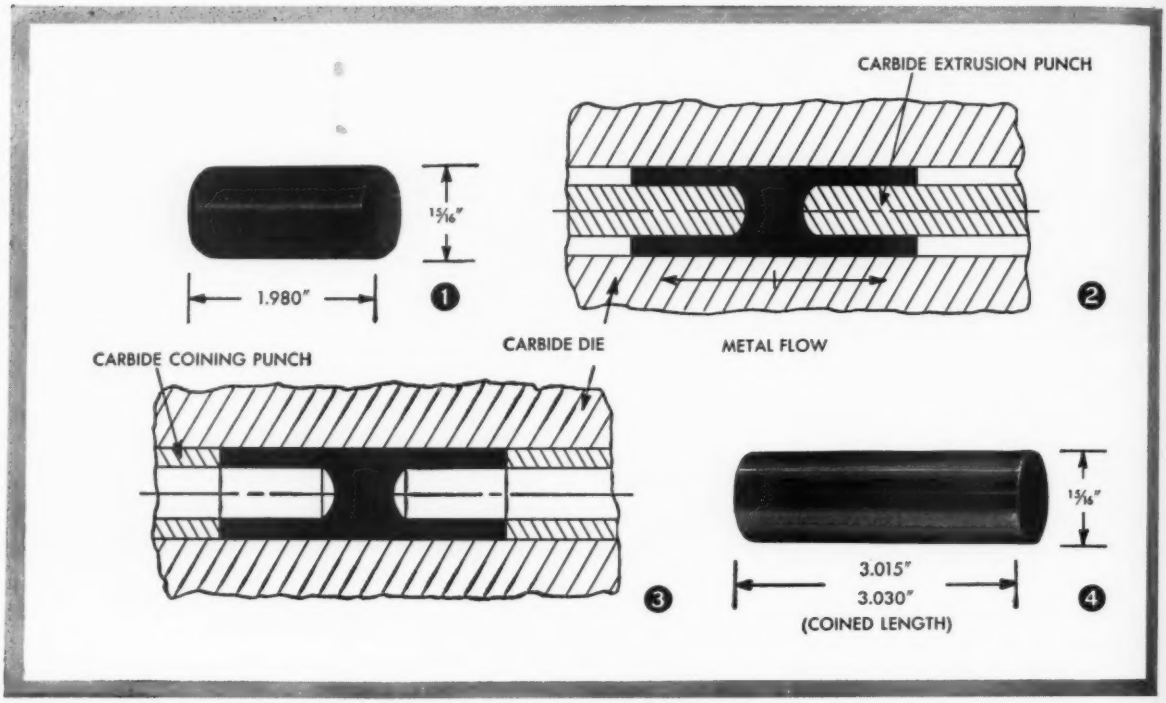
DEPARTMENT E-8

ROCHESTER, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 101

Increased output, material savings, and improved strength are accomplished . . .

Ford Motor Company cold-extrudes steel wrist pins with Carboloy dies



Solid steel slug (1) is cold extruded by opposed carbide punches (2) into correct shape. Carbide coining punches (3) size the pin to correct length, holding 0.015" tolerances. Finished pin (4) has the same volume of metal as the original slug. Only metal loss is in finish-grinding operation.

Almost 2000 two-inch steel slugs are cold extruded into three-inch wrist pins every hour at Ford Motor Company's new Cleveland engine plant.

The eight-station die holding the work, and the punches that extrude and coin the pin, are made of Carboloy* cemented carbide. By cold extruding with carbide dies, Ford has gained these important cost and product advantages: stronger, better parts, made from a low carbon, low alloy steel, with no scrap loss from machining . . . produced far faster than possible by machining.

Cold extrusion with carbide dies and punches can bring these and other benefits to many metalworking companies. Carbide engineers, with years of experience on cold-extrusion problems, are available to help work out specific applications.

To find out if cold extrusion with Carboloy cemented carbide dies is feasible for your application, check with your diemaker, or send your specifications to: *Metallurgical Products Department of General Electric Company, 11111 E. 8 Mile Street, Detroit 32, Michigan.*

CARBOLOY®

CEMENTED CARBIDES

*"CARBOLOY" IS A TRADEMARK OF GENERAL ELECTRIC COMPANY

CIRCLE INFORM-A-GRAM KEY NO. 102

The auto industry itself is preparing for the expanded market by huge capital investment programs. During the 10 years since the end of World War II, the industry has spent some $6-billion on new plants and facilities and on the modernization of existing plants. "In the five years immediately ahead," Newberg estimates, "it will probably invest another $6- or $7-billion to get ready for the tremendous growth markets that are certain to open up in the early 1960s."

Despite the signs of a prosperous future, however, Newberg warned of "an increasing serious capital shortage of another kind altogether." He referred to the "ever-increasing failure of our educational system to train enough young scientists and engineers to enable this country to realize its tremendous potentials and keep it competitive with the rest of the world."

Stating that the situation is getting steadily worse, Newberg said he had no pat solution to offer. "It does seem to me, however, he said, "that what is needed more than anything else, perhaps, is a new set of values. Somehow, we need to fire up our young people to the challenge of scientific discovery and engineering research. And we need to find ways to give greater incentive, financial and otherwise, to those with the brains and talent to become inspired teachers.

"It is important to get down to fundamentals and think about ways of and means of making the teaching profession more attractive," Newberg believes. "Just because we have always paid our teachers the equivalent of less than we pay our unskilled industrial workers is no reason we have to go on doing so."

Flat Gage and Die Steels Feature Precision Grinding

Complete new lines of VULground flat ground gage and die steels, both oil hardening and air hardening types, feature precision grinding and high micro finish.

These ground steels are prepared by Vulcan Crucible Steel Division. H. K. Porter Company, Aliquippa, Pennsylvania and come in standard 18" and 36" lengths and a wide range of standard thicknesses and widths.

BOOKS AND REPRINTS ARE AVAILABLE!

See Huebner Ads on Pages 110, 114 and 133

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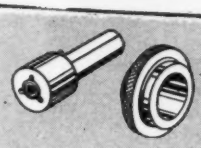
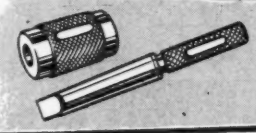
THREAD GAGES



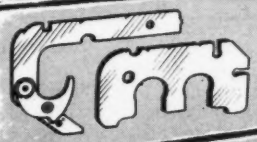
Cylindrical GAGES



TAPER GAGES

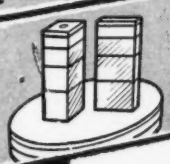
ROLL THREAD SNAP GAGES
Adjustable Limit Snap Gages

Oil Country GAGES



RAILROAD GAGES

PRECISION END MEASURES



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SHOP AIDS

The Basic Theory of Vibration Isolation and Shock Absorption is discussed in Bulletin SVC-55 issued by T. R. Finn & Co., Inc., Industrial Div'n, 200 Central Ave., Hawthorne, N. J. The bulletin describes the various types of machinery vibration; gives basic data, formulas and graphs; and reviews practical methods of shock vibration and control. **Circle Inform-A-Gram No. C1.**

"Cap Screws . . . How Much Torque?" contains an answer to "how tight is tight." The folder maintains that the more torque, the better — provided the resultant preloading doesn't exceed the yield strength of the screw. Dynamic stresses, flexing and relaxing an imperfectly tightened fastener are causes of fatigue failure. The Cleveland Cap Screw Co., Box 600, 2917 E. 79th St., Cleveland 4, will supply copies of the folder which includes tables of recommended torques for the company's own cap screws and place bolts, or — **Circle Inform-A-Gram No. C2.**

Fixture Clamps and Details are presented in this catalog from Monroe Engineering Products, Inc., 1515 Hurd Rd., Monroe, Mich. A photographic index is featured on the outside margin of each page. A specification table and detailed line drawing accompany each photo. Also included are full size tracing templates of fixture clamps. Assemblies of a similar type are grouped on one-double-sized page and all critical dimensions are detailed. Copies of the catalog are made available by the company, or—**Circle No. C3.**

This Hack Saw Selector gives the teeth/in and approximate strokes/min, feed pressure, and positive feed for various types of hand and power blades. Also presented is a table listing

blade widths with recommended torque wrench and fixed tension device readings. On the reverse side are shown the types of blades available. For your copy of the Selector, contact H. K. Porter Co., Inc., Henry Disston Div'n, Philadelphia 35, or — **Circle Inform-A-Gram No. C4.**

Proper Selection of Guide Pin Bushings for die sets is detailed in an illustrated bulletin. Included is information on standard bushing design, special bushings, lubrication and choice of materials. The standard bushing sizes carried in stock are listed with complete dimensions. Detroit Die Set Corp., 2895 W. Grand Blvd., Detroit 2, will provide copies of Bulletin 56, or — **Circle Inform-A-Gram No. C5.**

Industrial Felt Specifications, in tabular form, are included in a Felt Folder provided by Continental Felt Co., Inc., 22-26 W. 15th St., New York 11. In addition to the table, there's a discussion of how various felts are specified. Given are 12 S.A.E. felt samples by Continental with recommendations for the applications of each. Also listed are functional uses of felt, both wet and dry. **Circle Inform-A-Gram No. C6.**

Large Diameter Thin-Wall Tubing is the subject of Data Memorandum No. 4 prepared by Superior Tube Co., 1733 Germantown Ave., Norristown, Pa. Described is tubing with 5/8" to 2½" O.D. and wall thicknesses of 0.035" and less. A section on fabrication gives information on bending, beading, flaring and welding. A table on standard production limits lists sizes and wall thickness for more than 20 analyses in which the tubing is produced. Other tables give the standard tolerances for size, ovality, straightness and length. Obtain copies of the data memorandum from the company, or — **Circle Inform-A-Gram No. C7.**

¼ and ½ Scale Template Sheets for Wespo toggle clamps have been announced by West Point Mfg. Co., 26935 W. 7 Mile Rd., Detroit 19. These reduced size templates are convenient to use on ¼ and ½ scale drawings of large parts. Obtain the sheets from the company, or — **Circle Inform-A-Gram No. C8.**

"Designing with Kennametal" provides mechanical information required by engineers who design parts that call for the use of Kennametal cemented carbide. Included are basic design principles, types of Kennametal, fastening methods (cementing, brazing and mechanical), finishing, typical design problems and typical applications. Kennametal Inc., Latrobe, Pa., will issue copies of the illustrated 44-page Booklet B-222, or — **Circle Inform-A-Gram No. C9.**

Universal Drill Bushings are available in a complete range of standard sizes and lengths. Special sizes made to order. Vastly increased production facilities assure immediate deliveries. Write to the office nearest you, Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.

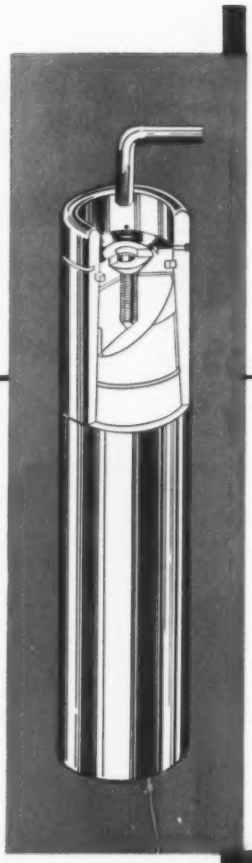
Universal products include: Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, "Kwik-Switch" Tool Holders, Mikro-Lok Boring Bars, Standard Drill Bushings, and Universal Index Plungers. Write for catalog.

189

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 105



One Man Removes Large Punch Holder in 3 Minutes!

with SUPERIOR

REMOVABLE CAP GUIDE PINS

End Troublesome Binding in Die Set Assembly

Superior's Removable Cap Guide Pins eliminate punch holder binding on guide posts when parting dies. The cap is removed from the pin merely by loosening a socket head screw which holds the cap in place. This frees the punch holder at the most critical point of the pin where it is apt to cock or bind. Instead of needing 2 or 3 die makers to remove the punch holder from a set, one man can easily do this work alone in a few minutes.

NOW OFFERED IN PIN DIAMETERS OF 1¼" UPWARD, AS STANDARD EQUIPMENT ON ALL SUPERIOR DIE SETS. SPECIFY IF DESIRED. WRITE FOR COMPLETE FREE INFORMATION.

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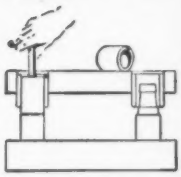
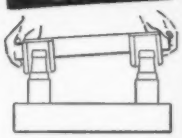


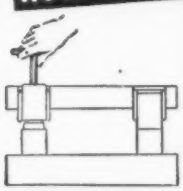
REMOVING CAP

SAFE

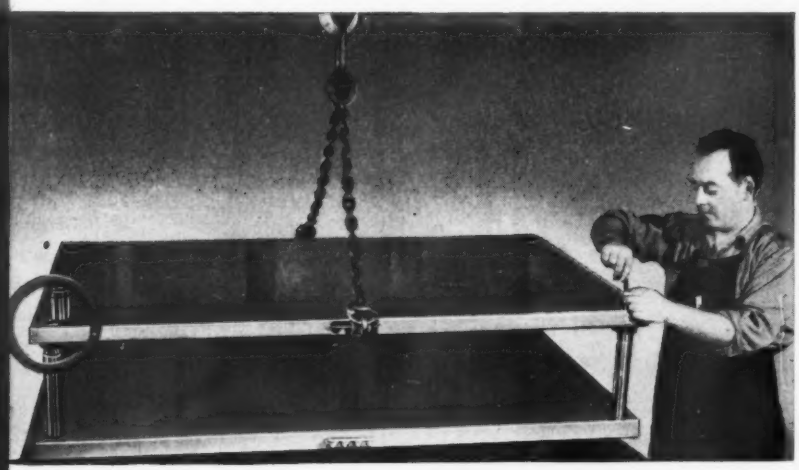


PARTING DIE SET

ACCURATE



REPLACING PUNCH HOLDER



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2734 S. 19th ST., MILWAUKEE, WIS

CIRCLE INFORM-A-GRAM KEY NO. 106

BELLEVILLE SPRING WASHERS

From a recent seminar on springs, conducted for design engineers by a leading spring manufacturer, came interesting historical data concerning the origin of spring washers.

These, in their most simple form, are heat treated spring steel washers which have been dished to form a coned disc spring with relatively large load capacity for the space occupied by the installation.

The first application of this type of spring is credited to Timothy Hackworth of England who, in 1835, applied it to a safety valve. In 1866, 31 years later, a British patent on this type of spring was granted to Julien Francois Belleville, a French civil engineer residing in Paris. His applications of what has become known as the Belleville spring included artillery recoil mechanism and buffer parts for railroad cars.

In most textbooks, the term "coned disc spring" is used as being more descriptive of the form or shape of the spring. In recent years, many variations in contour have been devised which contribute to the attributes of this type of spring. They are usually used in groups of one or more pairs with their concave surfaces facing each other, and, in assembly, with a rod or bolt extending through the central hole.

Possibilities in variable load-deflection curves are very numerous depending on the ratio of the disc to the metal thickness, the inclusion of scalloped edges and radial slots of various designs.

Primarily, the objective gained in using this spring washer is maximum load with small deflection in a small space.

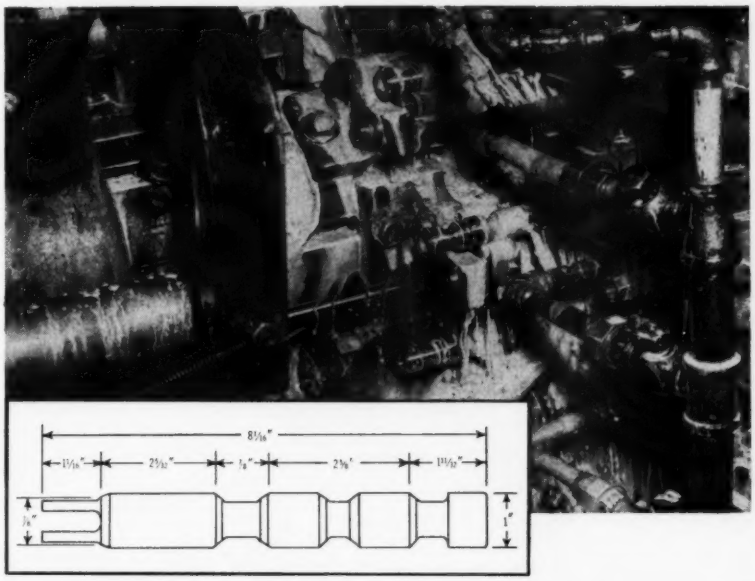
Application, design, and performance data on Belleville or coned disc springs may be obtained from Union Spring & Manufacturing Company, New Kensington, Pennsylvania, or — **Circle Inform-A-Gram No. D1.**

HORTON CHUCK DIVISION SOLD

An agreement has been reached by Greenfield Tap and Die Corporation to purchase all of the assets of the Horton Chuck Division of E. Horton & Son Company of Windsor Locks, Conn.

For the present, manufacturing operations will continue in Windsor Locks and no immediate changes in sales policies are contemplated. D. H. Thomson continues as General Manager of the Horton Chuck Division and G. S. Chiaramonte as Sales Manager. Expansion of the Horton Chuck facilities is contemplated.

A Finished Part Every 32 Seconds and Still Cool Enough to Handle...



...Proof that Park Kem-Cut Has Highest Heat Removal Capacity of Any Coolant!

At the Peterson Machine Products Corp., Detroit, new Park Kem-Cut Metal Cutting Concentrate has proven itself to be the key to cooler work, greater tool life, and increased production. Here is the data on a typical operation with Kem-Cut:

Machine:	Eight Spindle, 1-5/8" Conomatic Screw Machine, 363 r.p.m.
Part:	Tandem Valve Plug
Steel:	SAE 8620
Operation:	Forming, drilling, and cut-off. Stock removed at 133 s.f.p.m., .006 feed. Stock cut is 1-1/16"
Results:	Finished product every 32 seconds that's cool enough to handle. Finish remains excellent throughout entire operation
Savings:	Initial cost of Kem-Cut was $4.23 or 5.6c per gallon: cutting oil was $30.75, or a saving of $26.52

This is just one of the operations in which Kem-Cut is used at Peterson Machine Products. According to Leo V. Peterson, Vice President and General Manager, the use of Kem-Cut has meant "greater tool life, cooler work, greater production, washing of parts eliminated, and double tool life because a finer finish has permitted less finish grinding up to as much as .005 to .008 inches."

Park Kem-Cut is a premium quality chemical and oil cutting compound. It forms a stable emulsion in all concentrations and applies to nearly all metal cutting operations. Kem-Cut is so versatile it does 95% of all operations. Tool life is greater as Kem-Cut has the highest heat-removing capacity of any coolant. It is the ideal coolant for your metal working demands and provides finer surface finishes, higher production rates, and longer cutting tool life.

Product quality is guaranteed by Park Chemical Company, suppliers to the metal working industry since 1911.

SEND FOR FOLDER TODAY

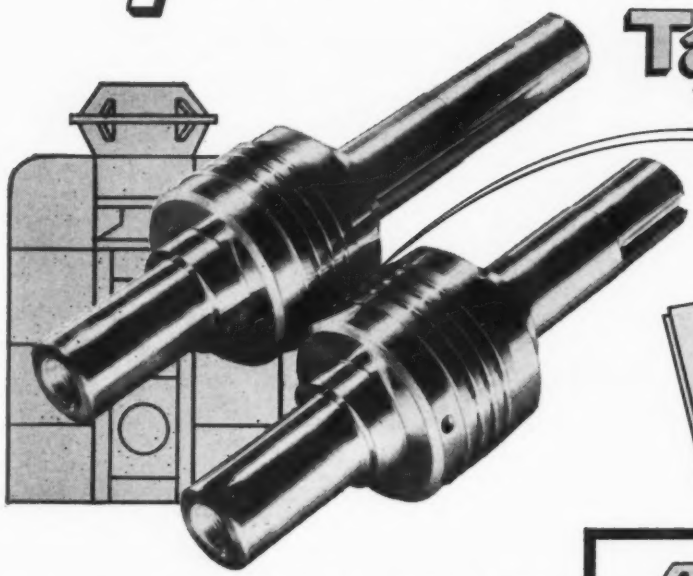
Park

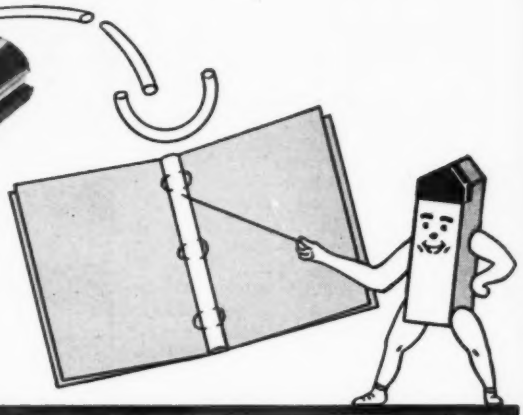
PARK CHEMICAL COMPANY
8074 Military Ave. Detroit 4, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 107

7 years' continuous service with Talide® ROLLS

(TUNGSTEN CARBIDE)





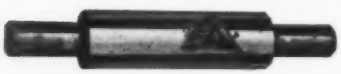
● A large Eastern Producer of oval-shape wire for loose-leaf notebook rings was experiencing excessive wear and pick-up. The high scrap rate was making the item unprofitable. Metal Carbides service engineers were called in to determine if Talide rolls could correct the trouble. Hi-carbon wire was being reduced on a 2-hi cold rolling mill to an oval shape .100" thick x .156" wide. Considerable stress and pressure was required to deform the wire to proper shape.

Our engineers designed a roll incorporating a carbide sleeve having 3 grooves ground in periphery and mounted to a special alloy steel arbor. The initial pair of rolls was installed in 1948 and has been in continuous service ever since. Due to their extreme hardness it has not been necessary to remove them from the mill during this 7-year period—not even for a regrind! Size and shape of wire has been perfectly maintained. Customer has since installed similar rolls on all their mills.

SUPERSET GRINDING WHEEL

The Superset diamond grinding wheel was specially developed for grinding carbide rolls to highest possible surface finish and luster. Made of 4-8 micron size diamond dust, it imparts a surface finish far superior to any other commercial wheel. Available in sizes up to 25" diameter.

EXCLUSIVE REPAIR SERVICE



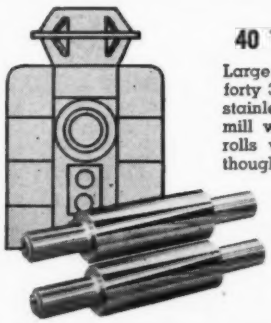
BEFORE

AFTER

Broken or damaged carbide rolls can be re-worked to first class condition with all defects eliminated at one-half original cost. Only Metal Carbides offers this service—because of its exclusive hot press method.

Metal Carbides Corporation,
Youngstown 12, Ohio.

Send for new 84-page catalog 56-G

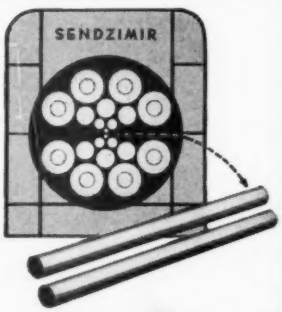


40 TIMES MORE TONNAGE

Large Steel Producer cold rolls forty 3,000 lb. coils (60 tons) of 18-8 stainless steel, series 300, on 4-hi mill with one pair of solid Talide rolls with no surface wear, even though strip work hardens to 50 Rockwell "C" in one pass. Flatter, smoother strip produced—even when rolling intermittent widths. 40 pairs of steel rolls were required previously to produce same tonnage.

ROLL LIFE INCREASED 278 to 1!

All users of Sendzimir rolling mills have adopted Talide work rolls because operating results have been phenomenal, far surpassing all expectations. Tremendous production runs are commonplace with mill after mill reporting increased tonnage runs between roll changes of 278-1, 179-1, 82-1, etc.



Talide Rolls are made in lengths up to 100", diameters up to 25", and up to 5000 pounds by weight.

METAL CARBIDES CORPORATION
MC
TALIDE®
YOUNGSTOWN 12, OHIO
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • CERMETS • HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO. 108

An open letter

UNIPUNCH

Telephone 4-0476

TO PRODUCTION MEN INVOLVED IN TOOLING:

You are invited to call on the experience of Punch Products' Engineers, who have personally accumulated over 90 years of know how" in the field of Unitized Tooling, to recommend the most efficient and economical method of producing punched or notched parts.

Many leading manufacturers have taken advantage of this personalized engineering by calling in our experienced personnel or sending us part prints for analysing their complete tooling program ---- large or small. From this information, we submit comparative cost charts showing the savings produced by UNIPUNCH Tooling over present methods. In many cases, the savings more than pay for UNIPUNCH Tooling during the first production run.

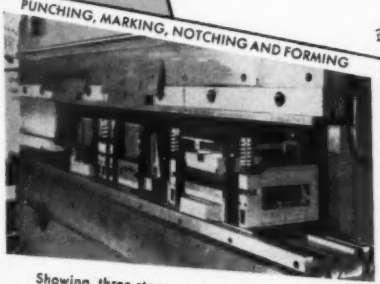
You, too, will know how much you save before you go into production --- even before you invest in UNIPUNCH Equipment --- by sending us a set of part prints for our recommendations and cost analysis. No obligation, of course.

Your inquiry will receive my immediate attention.

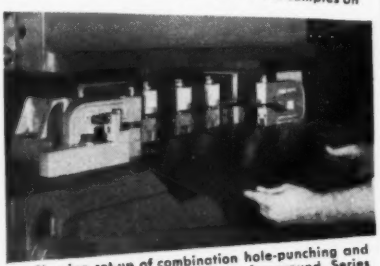
Very truly yours,

Jerome F.Ferdinand
Sales Manager

PUNCHING, MARKING, NOTCHING AND FORMING

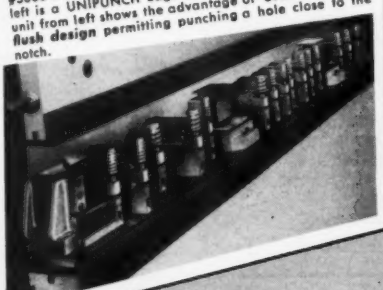


Showing three-stage, pass along, set-up which is template mounted on a #5100 Unipunch Bed Rail. First operation, beginning at right, punches 2 holes and numbers part. Second operation punches 3 holes and notches 2 corners. Third operation forms part. Note samples on ram.



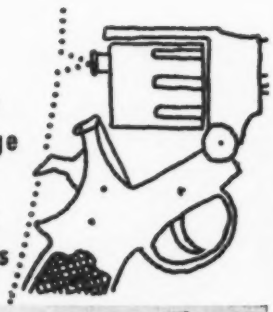
Showing set-up of combination hole-punching and notching with finished work piece in foreground. Series A Units punch and notch material from shim stock to ¼" thick.

Set-up of UNIPUNCH Series A Hole-Punching and Corner Notching Units on a strip template mounted on a #5000 bed rail in a press brake. The seventh Unit from left is a UNIPUNCH Edge Notching Unit. The second unit from left shows the advantage of UNINOTCH Unit flush design permitting punching a hole close to the notch.



UNIPUNCH

Fit like a Cartridge in Close Quarters



O-M (150 PSI AIR— UP TO 1500 PSI OIL)

TIE-RODLESS CYLINDERS

These compact, streamlined cylinders, that require ⅓ less installation space than the conventional type, slip easily into the hard-to-reach places, because the O-M Special Interlocking Mechanism eliminates both tie-rods and projecting end caps. Besides, the precision honed, seamless steel cylinder body can be turned down to fit in unusually tight spots.

Other important features that reduce maintenance costs and step up efficiency include:

- ***Two Point Bearing,*** one on piston and one in rod gland provide better balance and protect against drag on rod—giving O-M the lowest co-efficient of friction at low or high speeds;
- ***End Covers*** (heads) machined steel;
- ***Leather Back-ups*** on Hydraulic cylinders prevent extrusion on end plugs—O-ring seals;
- ***Piston Packings***—Self-adjusting U-cup, Vee, or ring type;
- ***Rod Packings***—self-adjusting U-cups for air, Vee-type for oil;
- ***Rod Scraper***—cleans piston and protects rod, packing and bearing;
- ***Mounts***—interchangeable, ductile iron or steel—easily installed without disassembling cylinder;
- ***Ports*** can be oriented to facilitate piping;
- ***All Cylinders*** tested at operating pressures before shipment;
- ***Cylinder*** easily disassembled, inspected, serviced, and re-assembled.

Available in a full range of sizes (1½" to 8" bores) with standard, 2 to 1, or oversize rods with male or female rod end, and length of stroke to meet your requirements. Completely interchangeable parts.

Write TODAY for FREE catalog showing cylinders and complete line of mounting brackets

ORTMAN-MILLER MACHINE COMPANY
21 143rd Street, Hammond, Indiana
☐ Have representative call
☐ Send Bulletin 103
Name_____Position_____
Company_____
Address_____
City_____Zone___State_____

CIRCLE INFORM-A-GRAM KEY NO. 110

FINISHING TRICK

Two men working side by side with compressed air guns spray two colors of paint on fenders at the same time at Buick. The trick of doing it simultaneously was developed by Buick engineers who were faced with the problem of painting front fenders one color on top and another on the bottom . . . without sending them through the spray line twice.

The answer was a metal shield, 6" wide and the length of the fender behind the wheel cutout. The shield fits snugly along the side of the fender, projecting out at right angles. It is held in place by its own weight, suspended from tiny hooks which fit into the holes where the fender trim is later bolted.

One man sprays the top color and a second man the bottom. The shield prevents both splashing and overlapping.

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NOW AVAILABLE

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1975 Lee Road, Cleveland 18, Ohio

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Check, money order or cash with order, please. Open account shipments on company purchase orders when total amount exceeds $3.00. No. C.O.D.'s please. Ohio customers add 3% sales tax. Quantity Prices quoted on request.

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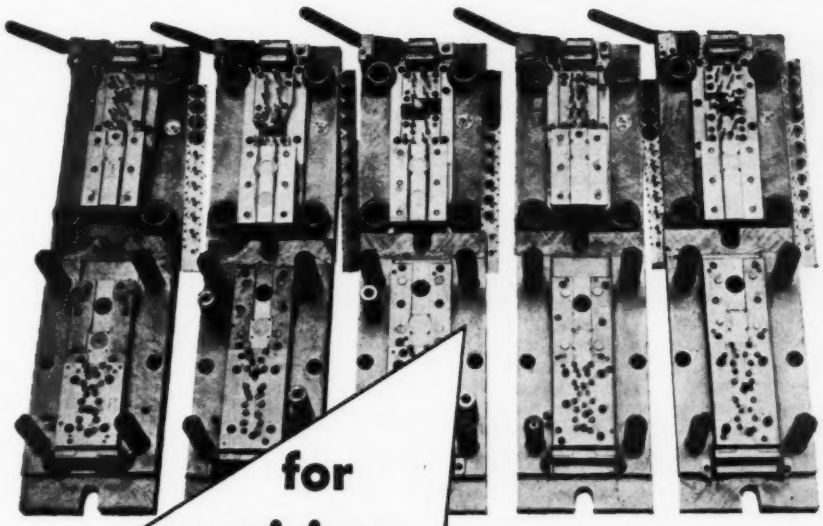
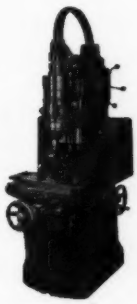


for precision jobs like this....Moore Jig Borers and Jig Grinders are "MADE TO ORDER"

NO. 2 MOORE JIG BORER. Range 10" x 16" x 16" height. Features infinitely variable spindle speeds, three power feed ratios, centralized controls.



NO. 2 MOORE JIG GRINDER. Range 10" x 16" x 16" height. Grinding speeds from 12,000 to 60,000 rpm. Infinite feeds up or down; spindle-housing heat control; features slot grinding attachment.

"HOLES, CONTOURS AND SURFACES

is bound to become a classic to the man or shop that does accurate work."

American Machinist Book Review

424 pages — $5 U.S.A., $6 elsewhere

Moore Jig Borers and Jig Grinders are made to order for jobs that require precision hole location—and plenty of it.

Take, for example, these five progressive compound dies used to pierce, shave, gut and blank intricate timing-device parts.

Holes in punch plate and stripper were jig bored in a No. 2 Moore Jig Borer. Holes in the corresponding die parts were jig bored in the same precision machine, hardened and then jig ground in a No. 2 Moore Jig Grinder. Perfect line-up was insured, since all holes had to be held to ± .0002", both for position and hole size.

The No. 2 Moore Jig Borer, with its built-in system of accurate lead screws, can spot, drill, bore or ream all holes in a workpiece to "tenths" with minimum tool changes. The No. 2 Moore Jig Grinder can accurately contour grind, slot grind and form grind die sections in a third of the time required by other means.

These Moore toolroom teammates provide a one-two punch that can knock the fat off your diemaking costs. They supply an *Engineered Hole Location Service* that permits tool and die sections to be produced concurrently...puts diemaking on an interchangeable-parts-and-assembly basis...lengthens die life...*saves you time and money* all along the line.

Write today for our detailed literature that pictures and describes many toolroom and production jobs for which Moore Jig Borers and Jig Grinders are made to order.

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Ave., Bridgeport 7, Conn.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 111

Business Management Aids

"Better Records for Every Record-Keeping Need" is a catalog of business and accounting forms. Listed and illustrated are forms for ledger or post binders, ring binders, visible records (ring and vertical types), bound books, pads, and machine bookkeeping systems. This catalog is arranged to aid in revising or expanding a record-keeping system or in setting up a new one. In addition, samples of Eye-Ease and white ledger pages are included for comparison. For your copy of the Better Record Catalog, contact National Blank Book Co., Holyoke, Mass., or — **Circle Inform-A-Gram No. F1.**

A Subject File System designed to save many lost hours of executive time is described in Folder BSD-46 issued by Remington Rand, Div'n of Sperry Rand Corp., 315 Fourth Ave., New York 10. The bulletin, "How to Save Executive Time," explains that with a properly organized subject file, any required record can be obtained in less than one minute and all the facts are in one folder. The literature also outlines the difference between a subject file and an alphabetical file, and tells how Remington Rand file organizers go about setting up such a file.
Circle Inform-A-Gram No. F2.

A Hand Microfilm Scanner is used for quick scanning of microfilm in aperture cards, in jackets, or unmounted. Filmsort Micro-Midget, Model MG, can be used in any light and makes possible the examination of a section of an engineering drawing or other microfilmed documents. The small reader which weighs 5 oz, affords a 4-times magnification. The lens diameter is 12.69 mm. Filmsort Div'n, Dexter Folder Co., Pearl River, N. Y., or —
Circle Inform-A-Gram No. F3.

Module Multiprotection Plan, a new idea in employee benefit planning, is discussed in a booklet from Mutual of New York, Broadway at 55th, New York 19. Module which means a mass-produced unit of benefit, is made possible by electronics. The plan is considered in terms of long range cost guarantees, simplicity, and benefits. This plan provides a solution to three personal hazards faced by each employee — death, disability, and old age. Mutual will prepare a specific plan according to individual company specifications. **Circle No. F4.**

Engineered Special Hazard Fire Protection is detailed in a bulletin from "Automatic" Sprinkler Corp. of America, Youngstown 1, O. Discussed are the origin of such protection and its applications and economies. Sections are devoted to the methods of fire detection, prevention, control, and extinguishment. Also included is a special hazards fire control and extinguishment chart and "Automatic" sprinkler installations. The final section is devoted to outlining a comprehensive program of fire protection.
Circle Inform-A-Gram No. F5.

"10 Ways to Cut Costs with Inside Telephones" tells how 10 different organizations are saving money with P-A-X, the privately-owned, rent-free dial telephone system used exclusively for inside calls.

Quoting executives of these firms, the booklet explains the role of the system in stepping up production, saving time, cutting costs, improving customer relations, and effecting further company benefits. Copies of Booklet 1865 are supplied by Automatic Electric Sales Corp., 1033 W. Van Buren St., Chicago 7, or — **Circle Inform-A-Gram No. F6.**

The Advantages of In-Plant Photography are cited in a new booklet released by Graflex, Inc., 154 Clarissa St., Rochester 8, N. Y. It tells how industry is saving time, cutting costs, and increasing sales with photography. The booklet describes economies achieved in aircraft, metal, machine, heavy equipment, and other industries through the use of company-sponsored photography. Also depicted are situations where pictures have shown the capabilities of heavy equipment and new products, in improving communications in employee relations, and in aiding engineers. Copies of "Industry Cuts Costs with In-Plant Photography," are made available by the company. **Circle No. F7.**

The Proper Use of Modern Visual and Audible Signals for industrial manufacturing plants of all types is detailed in a comprehensive summary bulletin. It provides an overview of signalling in industry today. Listed and discussed are the three major factors in the selection of any signal and the purposes of the various signals for outdoor areas and indoors. Intensity and pitch of audible signals are defined and their application to practical problems is specified. Also given is a diagrammatic scale-model plan of a proper signalling system for a plant. For copies of Bulletin 100, "How to Select Signals," write to Signal Div'n, Dept. PR, Federal Sign and Signal Corp., 8700 S. State St., Chicago 19, or—**Circle Inform-A-Gram No. F8.**

A Copying Machine will produce direct copies from originals whether the originals are opaque or translucent, on white or colored paper, and printed on one side or both. The Thermo-Fax "Secretary" copying machine needs no special master, negatives, nor intermediate preparatory steps. The use of the 4-sec machine will result in speedier communications, better informed management, and cost savings. For further details on the machine, contact Minnesota Mining and Mfg. Co., St. Paul 6, Minn., or —
Circle Inform-A-Gram No. F9.

"Modern Control of Building Temperatures from Outdoors" describes in detail, with diagrams, a complete line of outdoor-type automatic heat controls. Three classes of weather controls available are: time switches, Weather-Man controls, and Indoor-Outdoor controls. Copies of Bulletin C-256 can be obtained from Automatic Devices Co., Inc., 714 Hillgrove Ave., Western Springs, Ill., or—**Circle Inform-A-Gram No. F10.**

"An Executive Approach to Lubrication Problems" shows the profit possibilities of good lubrication in protecting capital equipment, maintenance operations, and in original equipment. The booklet emphasizes the importance of an examination of lubrication methods as a source of cost reduction. Alemite automatic lubrication systems and their advantages are discussed and illustrated and how the equipment saves time in handling lubrications is pointed out. Alemite Div'n, Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14, will provide copies of the booklet, or—**Circle No. F11.**

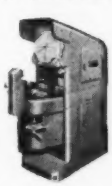
DROOBLES

by ROGER PRICE

J&L

Bench Model BC-7

Floor Model FC-30



Floor Model FC-14

Table Model TC-14
(Vertical Inspection)

"BOBSLED RUN FOR FLEAS"

Although it seems screwy, here's proof that fleas have *their* Olympic Games, too! And they're mighty impressive, so I understand. After singing their stirring anthem "The Battle Cry of Fleadom", the little chaps plunge into a series of thrilling athletic events. In addition to the 50-inch dash, there's the brad jump, the poodle vault and and the pocket mirror-thon. The main event is the golf match over the rugged Airedale course. The competitors in this are especially jumpy, because it's a tricky layout complete with dog-legs, and they all start from scratch.

While you're here — if you are — I'd like to put a flea in your ear about the J & L Comparator. It is an ingenious inspecting and measuring instrument that speedily and precisely handles all sorts of parts and objects, in a variety of sizes and shapes. The J & L Comparator is accurate to .0001", and is equally suited to both production-line and job-shop work. It is extremely flexible in application, and enables you to perform inspections that are not possible by any other method. Available in eleven models. Interested? Write Dept. 710 for complete information *today!*

JONES & LAMSON OPTICAL COMPARATORS

- **"KEY INSTRUMENT IN INSPECTION"**
- **"PROTECTS QUALITY PRESTIGE"**
- **"CUSTOMERS' REJECTIONS KEPT VERY LOW"**
- **"SAVES FROM $3 TO $5 PER HOUR"**

Modern Corporation, Detroit, Michigan, manufacturer of fine MODCO cutting tools, says this about their 30-inch J & L Comparator: "Modern Corporation's 30-inch J & L Comparator has become the key instrument in the inspection of fine MODCO tools. Its size enables the inspector to examine the complete contour of most tools, without transfer of reference points, and thus without the chance for human error to creep in."

Photo courtesy of Modern Corp., Detroit, Mich.

While the primary reason Modern Corporation bought the Comparator was to promote inspection accuracy, it is showing an important cost saving: Every time the J & L Comparator is used on large tools, it saves from three to five dollars per hour.

JONES & LAMSON

World's Largest Manufacturer of Optical Comparators since 1919

JONES & LAMSON MACHINE COMPANY, 519 Clinton St., Springfield, Vt., U.S.A.

OPTICAL COMPARATOR DIV.

CIRCLE INFORM-A-GRAM KEY NO. 113

TECHNICAL BOOKS

DIE DESIGNING AND ESTIMATING ***Fourth Edition***

368 pages, 26 chapters, and over 400 illustrations, drawings, charts and graphs. Extensively revised and enlarged plus a special section of 165 Practical Points in Die Design and Construction. Completely indexed. IMMEDIATE DELIVERY. $7.50 per copy

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FILMS TO SEE

"The Leading Role" demonstrates the advantages of the tube as a structural form and tells how welded steel tubing is made. In addition, the film shows many different uses for tubing, reveals how tubing serves our everyday life, and shows typical fabrication of tubing into an automobile rear axle housing. The 25-min 16-mm black-and-white movie is available on loan, free of charge from Formed Steel Tube Institute, 850 Hanna Bldg., Cleveland 15.

●

The proper selection of fine tool steels for specific uses is the subject of Bethlehem Steel Co.'s film, "Teamwork." Covered are the uses to which steel is put and the closely controlled manufacture of alloy and tool steels to meet rigid specifications. Also depicted is how steel is transformed into such things as dies, cutters, etc. and how this steel must withstand heat, wear, and other adverse conditions in use. The 16-mm color-sound film can be obtained on a free-loan basis by writing to Modern Talking Picture Service, 30 Rockefeller Plaza, New York 20.

●

"Tracer Control in Action" portrays the versatility of machine action built into Gorton pantographs and duplicators. Difficult or otherwise impossible milling, profiling, and engraving operations are shown being performed on the machines which are not restricted by gear-driven constant feeds nor by longitudinal and transverse lead screws. Included are applications of the equipment from producing the smallest engraving in the world to demonstrate precision and sensitivity, to machining workpieces of almost any shape or size to demonstrate versatility. The 16-mm color movie is loaned free of charge by George Gorton Machine Co., 1321-NN Racine St., Racine, Wis.

●

A slidefilm instruction course designed to aid in the training of industrial personnel in the selection and application of modern electric and electronic control equipment has been made available by General Electric Co., Schenectady 5. The course is composed of eight 35-mm color slidefilms and recordings and includes an instructor's manual and eight review booklets which contain the script and illustrations from the films. The slidefilms show how control equipment operates, what types of control are available, and how to select and apply the proper control for a specific application.

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PUBLICATION

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

"A New Dimension in Milling Cutter Design" covers the development of milling cutters which eliminate resharpening. The process is built around a new milling cutter that uses low cost "throw-away" type inserts which are indexed 8 times and then discarded. Bulletin C-85 is available from Wesson Co., 1220 Woodward Heights Blvd., Ferndale 20, Mich., or — **Circle No. B1.**

Index Units are offered as complete basic index chassis for application to automation requirements by Swanson Tool & Machine Products, Inc., Erie, Pa. Bulletin TBC 5-55 covers the Auto-Tran, Series B and C turret indexing units, Model H turret indexing chassis and Series K for center column tool mounting applications. In addition to data on the units, specifications on several standard accessories are included.
Circle Inform-A-Gram No. B2.

The Balanced Air System used in Dimensionair Air Gages and its 13 advantages are discussed in Dimensionair Catalog 56 D issued by Federal Products Corp., 1144 Eddy St., Providence 1, R. I. Among the new items listed are matched AirProbes, a differential air meter and the Probe-X. Another feature of the catalog is an expanded list of air plugs, both through hole and blind hole, available from stock.
Circle Inform-A-Gram No. B3.

Controls specifically engineered for better operation of presses and press accessories, automatic feed devices, scrap cutters, etc. are shown in a 12-page catalog. These controls provide better efficiency, flexibility, and safety than ordinary all-purpose electrical or mechanical controls. For copies of the Press Controls Catalog, write to Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, or —
Circle Inform-A-Gram No. B4.

Gages are highlighted in Catalog 56 released by Republic Gage Co., 2228 Fenkell Ave., Detroit 38. The catalog is divided into 2 sections — the first gives the sizes and prices of standard gages and the second, supplementary tables and data. Thread plug, reversible thread plug, setting thread plug, NPT pipe thread, and extra wear gages are among the items covered.
Circle Inform-A-Gram No. B5.

"Golden Circle Rotary Cutting Tools" presents Elgin's complete line of ground cutters, rotary files, miniature cutters, etc. These cutting tools will remove flash and scale, blend and smooth welds, touchup machined parts and clean out hard-to-get-at corners. Copies of the Golden Circle Booklet are supplied by Elgin National Watch Co., Abrasives Div'n, Elgin, Ill., or —
Circle Inform-A-Gram No. B6.

Production Speeds up to 30,000 Pcs/Hr are possible with the line of "Intermittor" index tables. A catalog gives the load ratings and dimensions of more than 150 of the standard tables. The line includes dial sizes ranging from 12" to 120" with from 4 to 36 stations. Obtain Catalog 301 from Ferguson Machine & Tool Co., P. O. Box 5841, St. Louis 21, Mo., or —
Circle Inform-A-Gram No. B7.

Here's the ONE outstanding wheel... for EVERY toolroom surface grinder

The Norton G BOND-32 ALUNDUM combination is unequalled for speed, versatility and economy*

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Typical Applications of the Iron Hand for automatic press unloading operations are described in a catalog released by Sahlin Engineering Co., Inc., P. O. Box 289, Birmingham, Mich. Included is information on the overhead Iron Hand, the portable model, turnover and transfer machines and other unloading machines. In addition, various types of gripping jaws are shown.
Circle Inform-A-Gram No. B8.

Punch Holders, Die Shoes, strippers, die adaptors and punches and dies are covered in Catalog P & D-1956 from Whitney Metal Tool Co., Rockford, Ill. The tools can be used on many makes of hand and power punches, punch presses, power presses, etc. The catalog illustrates the practical punch and die arrangements that can be used on punching equipment.
Circle Inform-A-Gram No. B9.

Eliminate Costly Resetting with self-perishing cemented diamond particle wheel dressing tools. These tools assure uniform finish throughout the tool life. The tools are suited for thread, centerless, internal, external, tool rotary, and surface grinders; and special applications. Koebel Diamond Tool Co., 9456 Grinnell Ave., Detroit 13, will provide copies of Form 356 with details, or—**Circle No. B10.**

Stamping, Drawing, Forming, riveting, bending, cutting, blanking, etc. operations are handled by Allen punch presses. These power bench type presses, accessories and standard and special punches and dies are covered in a catalog from Alva Allen Industries, Punch Press Dept., Clinton, Mo., or — **Circle No. B11.**

Long or Short Production Runs can be handled at maximum efficiency by a vertical precision boring machine. Model VBM automatic machine produces fine finishes because of the smooth, uniform motion of the table. Get your copy of a bulletin detailing the features and listing the specifications, from Wadell Equipment Co., 119 South Ave., Garwood, N. J., or —
Circle Inform-A-Gram No. B12.

Surface Grinding and Bench Grinder Wheels are covered in a catalog section, Form 56-4, released by The DoAll Co., Des Plaines, Ill. The literature contains data explaining the meaning of grinding wheel code numbers. The composition and applications of fundamental types of wheels are described. Also listed are the grinding wheel specifications and the types and sizes offered. **Circle No. B13.**

Simplified Adjustment of Roll Feeds is possible with a new vernier adjustment attachment. The unit can be attached to all roll feeds and assures accurate, fast adjustments. Complete information is given in a circular published by Durant Tool Supply Co., 136 S. Water St., Providence, R. I., or —
Circle Inform-A-Gram No. B14.

Maintenance and Miscellaneous Drilling are handled by Safety drill tables produced by Modern Machine Tool Co., 2005 Losey Ave., Jackson, Mich. A drill table, vise, set of parallels and V-block are combined in a single unit. Read all about the drill tables in a bulletin from the company, or —
Circle Inform-A-Gram No. B15.

The Norton G Bond is the most efficient vitrified bond ever developed for precision and semi-precision grinding. Wheels made with it bring you these valuable advantages:

Cooler, faster cutting action . . . heavier cuts without burning . . . closer tolerances and smoother finishes . . . easier dressing and more pieces per dressing . . . more work, and more kinds of work, per wheel.

Norton 32 ALUNDUM abrasive is another big advancement in grinding progress. It grinds exceptionally cool and fast, with minimum dressing, and is ideal for surface grinding jobs requiring fast stock removal and heavy feeds.

See Your Norton Distributor

for further facts on how the G Bond and 32 ALUNDUM abrasive add the "Touch of Gold" that saves time and money and improves product quality. Or write to the nearest district office of NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

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W-1716

THE FAMOUS NORTON G BOND holds each abrasive grain just long enough for maximum cutting action, assuring a constant grinding surface of fresh, sharp cutting edges. With 32 ALUNDUM abrasive it makes a great "Touch of Gold" team for grinding high speed and alloy steels. For other applications investigate Norton 38 ALUNDUM or 19 ALUNDUM abrasive. And remember, only Norton offers you such long experience in both grinding wheels and grinding machines to help you produce more at lower cost.

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CIRCLE INFORM-A-GRAM KEY NO. 117

Reduce Stamping Costs and Improve the Quality of Work with the Die-Draulic Grip for positive hold-down in drawing or forming. This device which eliminates springs and air pads, does away with die pad pressure problems. A bulletin details the principle of the Die-Draulic Grip, lists its advantages and tells how to determine grip requirements. The Die-Draulic Grip Bulletin with a price list is made available by Die-Draulic Grip, Inc., 528 Butterworth St., S.W., Grand Rapids 4, Mich., or **Circle Inform-A-Gram No. B16.**

Overcome Chatter, wheel marks, out-of-roundness and secondary operations needed for super finishing and lapping in cylindrical grinding with the new Red-E grinding concept. An illustrated folder lists the important points in the concept and explains the compensatory load distribution of bearing assembly which guarantees micro-finish and roundness to within less than 50 millionths. For copies of Folder 5-56, write to Ready Tool Co., 554 Iranistan Ave., Bridgeport, Conn., or — **Circle Inform-A-Gram No. B17.**

New
ARMSTRONG
Armide CARBIDE INSERT
TOOL HOLDERS

Embody...Convenience, Economy
Simplicity and Strength
based on these superior features:

- IMPROVED CLAMPING METHOD — speeds indexing of Inserts.
- REPLACEABLE SEAT of Hardened Tool Steel — protects shank and provides flat base to prevent damage to inserts as they are clamped in position.
- SHANK of Heat Treated Alloy Steel — gives extra strength and rigidity.

A slight turn of a single screw permits rapid indexing of the ARMIDE insert—reducing down time to a minimum.

The use of ARMIDE "throw away" inserts provides the economy of multiedged inserts—triangular inserts have six, square inserts eight cutting edges. These are available in Utility or Precision finish and in three grades of ARMIDE: 350, 370 or 883.

Protection to the shank is given by the replaceable tool steel seat which prevents wear and damage to the shank and provides a flat base for the insert reducing the possibility of damage to the insert as it is clamped in place. A relief groove is ground into the seat providing clearance when a dulled insert with "built up" edges is turned over.

ARMSTRONG ARMIDE Carbide Insert Tool Holders are furnished in two styles and three sizes. Complete data on these tools is given in Bulletin CIT, mailed on request.

Buy ARMSTRONG TOOLS from your Industrial Distributor

Write for catalog

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
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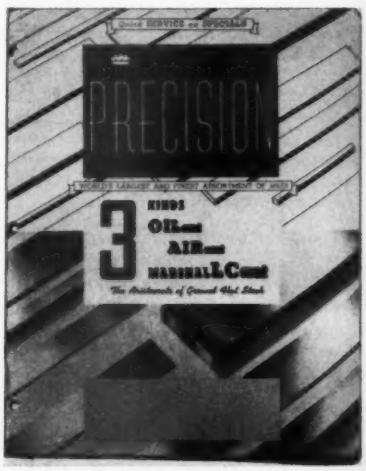
CIRCLE INFORM-A-GRAM KEY NO. 118

19 Contact Arrangements of limit switches are described in a new Lox-switch Bulletin. The direction of lever movement and spring return, and normal and operated circuits for each position are given in tabular form. Also included are a cutaway drawing, basic switch dimensions and principle features. For copies of Bulletin 356, contact R. B. Denison Mfg. Co., 102 St. Clair Ave., N.W., Cleveland 13, or — **Circle Inform-A-Gram No. B18.**

Deliver Fluids under Pressure into rotating shafts for a variety of purposes such as deep hole or gun drilling with Sealol fluid transfers. Types EL, EH, DH and EA are manufactured to meet the conditions of a wide range of uses, speeds and pressures. Bulletin 12A with details, ordering information and a power table is issued by Sealol Corp., Warwick Industrial Park, Providence 5, R. I., or — **Circle No. B19.**

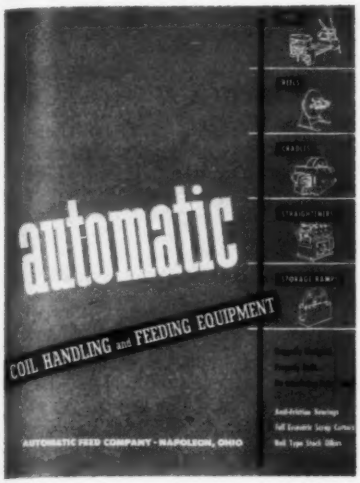
The Engineering and Development of Vibratory Parts Feeders is detailed in Catalog 356 supplied by Perry Equipment and Engineering Co., Erie, Pa. The equipment speed feeds parts for metalworking, packaging, processing, and assembly. The feeders deliver parts to the assembly lines at a predetermined rate to speed production and reduce manpower. **Circle Inform-A-Gram No. B20.**

Ground Flat Stock is the subject of a folder from Marshall Steel Co., P. O. Box 108, La Grange, Ill. Listed are five fundamental factors which contribute to good tools. Also given is heat treatment data for each of



the three Marshall grades — OILcrat, AIRcrat and MarshallCrat. In addition, there are steel weight tables for squares and 24" lengths (flats) and a formula for estimating steel weights for the sizes not listed. **Circle Inform-A-Gram No. B21.**

Automatic Coil Handling and Feeding Equipment is highlighted in a catalog from Automatic Feed Co., Napoleon, O. Covered are feeds, reels, cradles, straighteners and storage ramps. Each is described and



illustrated in a separate section complete with specifications. Also given is a glossary of terms and engineering data. **Circle No. B22.**

Thrufeed, Plunge, and Infeed Grinding is performed by Model TG-12 centerless grinder. This machine will grind small diameter forms, as well as long rods of small diameter. Tolerances as low as 0.0002" can be consistently held and 6 to 8 micro-finishes can be obtained. Royal Master, Inc., State Highway No. 23, Riverdale, N. J., will supply a folder presenting information on the grinder, or —
Circle Inform-A-Gram No. B23.

Over 200 Standard Models of Indexing Machine Chassis are offered by Swanson Tool & Machine Products, Inc., 800 E. 8th St., Erie, Pa. A folder illustrates and describes the standard chassis that can be provided to suit individual requirements for special purpose automatic machines. Also shown are actual applications of the chassis. Copies of Bulletin 356-5M can be obtained from the company, or —
Circle Inform-A-Gram No. B24.

Shaped Punches and Dies such as oblongs, squares, rectangulars, straight quills, ejector punches, etc. are the subject of new Catalog 105 issued by Ring Punch & Die Corp., Jamestown, N. Y. The catalog illustrates an expanded range of sizes along with new products in several grades of steel. Each item is described and its dimensions and specifications given. Also provided is engineering data.
Circle Inform-A-Gram No. B25.

"Superior Tube Nickel and Nickel Alloy Tubing" presents information on nickel and nickel alloys for use by designers, production engineers and purchasing agents. One section deals with the selection and application of the tubing. The tubing described is supplied in standard OD from 0.012" to 1.125" and monel tubing from 1⅛" to 2 1/16" OD with walls from 0.010" to 0.025". Superior Tube Co., 1733 Germantown Ave., Norristown, Pa., will provide copies of Catalog 12, or —
Circle Inform-A-Gram No. B26.

Accurate Cuts and Smooth Finishes are assured on tough jobs on stainless, aircraft and alloy steel when using a new cutting oil. Magnus Cutting Compound No. 2 which allows faster speeds and feeds is a transparent oil which permits the operator to see his work. It can be used on ferrous and non-ferrous metals. For complete information, contact Magnus Chemical Co., Inc., Dept. TP, Lubricants Div'n, Garwood, N. J., for a copy of Bulletin 137, or —
Circle Inform-A-Gram No. B27.

5203-B

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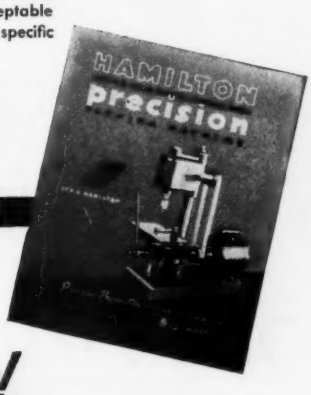
There is no way under the sun to do small, precision tapping with "production" speed, satisfactory tap life and acceptable accuracy, other than to use a tool designed for the specific purpose.

THE *Hamilton* SUPER-SENSITIVE SMALL HOLE TAPPING MACHINE IS SUCH A TOOL!



WANT ALL THE FACTS ?

Write for Hamilton Bulletin No. 5203. Address The Hamilton Tool Company, 832 South Ninth Street, Hamilton, Ohio.

IT'S A Hamilton Tool
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CIRCLE INFORM-A-GRAM KEY NO. 119

Direct Dimension Measuring and Automatic Positioning are features of the Fosmatic jig borer. The machine can be used for the finest toolroom boring or for production of precision holes. The machine can be equipped for either direct-reading measuring instruments or rod and bar measuring. Details on the machine, its features and specifications and extra features are found in a bulletin published by The Fosdick Machine Tool Co., Cincinnati 23, O., or—**Circle Inform-A-Gram No. B28.**

Die Cushions for presses with J.I.C. bed openings from 14" x 14" to 213" x 87" are presented in a 24-page catalog. Included are pneumatic, multiple piston pneumatic, pneumatic locking, hydropneumatic and custom type cushions, ranging in capacity from 3.93 tons to 301.5 tons at 100 psi. The catalog provides complete performance and dimensional data and engineering aids. Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, will supply copies of the Die Cushion Catalog, or — **Circle Inform-A-Gram No. B29.**

There's never a "leave-off" mark . . .

Over-all capacities:
Model 22-23S —
¼" to 1" ANPT
Model 24-25S —
1" to 2" ANPT

. . . with the new J & L Taper Receding Die Head

Now you can cut precision taper pipe, *dry seal*, and other taper threads to all standard specifications — *without chaser "leave-off" marks.*

J & L's new Taper Receding Die Head is *full* receding. Only the chamfered teeth and the first full tooth in the chaser set do the cutting. Pressures on the chasers are much less than those resulting from "form" or "jam" cuts. And cutting action is the same as that of straight threading. You get smoother threads — no "leave-off" lines — longer chaser life.

These new Taper Receding Die Heads also feature simple, controlled set-up and automatic operation. *Write for form #5430.*

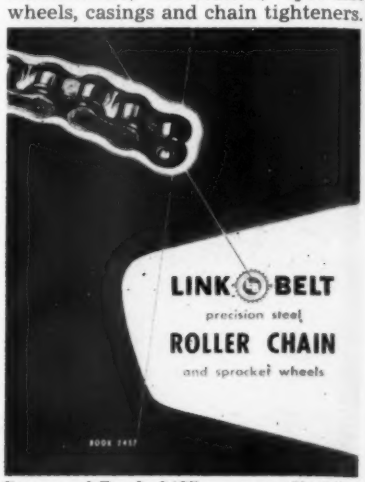
JONES & LAMSON

Class III Guaranteed Not Sometimes, but Everytime!

JONES & LAMSON MACHINE CO., 519 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L THREAD TOOL DIV.

CIRCLE INFORM-A-GRAM KEY NO. 120

A Complete Line of precision roller chain and sprockets is described in a 148-page book. Included are sections on stock drives, drive chain, conveyor chain, installation and maintenance, lubrication, sprocket wheels, casings and chain tighteners.



Copies of Book 2457 are supplied by Link-Belt Co., Dept. PR, Prudential Plaza, Chicago 1, or — **Circle Inform-A-Gram No. B30.**

The Universal Expanding Mandrel produced by LeCount Tool Works, Inc., 390 Capitol Ave., Hartford, Conn., is detailed in a brochure. This mandrel provides extra long bearing surface over a wide bore range. In addition to the straight jaw expanding mandrels, the brochure covers the Micro-Mite expanding mandrels for bores between ¼" x ⅜". **Circle Inform-A-Gram No. B31.**

A Torque Control Clutch for power screwdrivers operates on a frictionless, ball bearing principle which assures absolute torque accuracy, with or without lubrication. The torque control clutch eliminates damage to screw heads and prolongs the life of the bits used. For details get a bulletin from Livermont, Inc., Maple & Myrtle, Monrovia, Calif., or — **Circle Inform-A-Gram No. B32.**

Eliminate Feed Fingers with the self contained Hydra-Lite hydraulic bar feed. The bar feed which increases production, can be adapted to any single spindle machine requiring bar feed. Details, prices and specifications are in a bulletin from Boyar-Schultz Corp., 2000 S. 25th Ave., Broadview, Ill., or — **Circle Inform-A-Gram No. B33.**

Grinding, Welding, Filing, Crimping, assembling, etc. operations are facilitated by using air-powered Autovises. The Vi-Speed Autovises are available in bench and machine types. A deep jaw style is also produced. Details and specifications are in a bulletin provided by Van Products Co., Erie 7, Pa., or — **Circle Inform-A-Gram No. B34.**

The Application of Machine Setup Kits and Blocks is illustrated in a folder from Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland 10. The folder specifies a wide range of sizes of the setup tools which are shop time savers for setup of milling machines, jig borers, drill presses and other machine tools. Request copies of the folder from the company, or—**Circle No. B35.**

Straight, Circle, Figure and Slot Cutting are performed by a universal sheet steel and plate working machine. Nibbler Model 400B will also handle beading, folding, louver forming, nibbling, planishing and flanging operations. A circular with specifications, capacities and details is supplied by Tech-Pacific, 2811 Lafayette, Newport Beach, Calif., or **Circle Inform-A-Gram No. B36.**

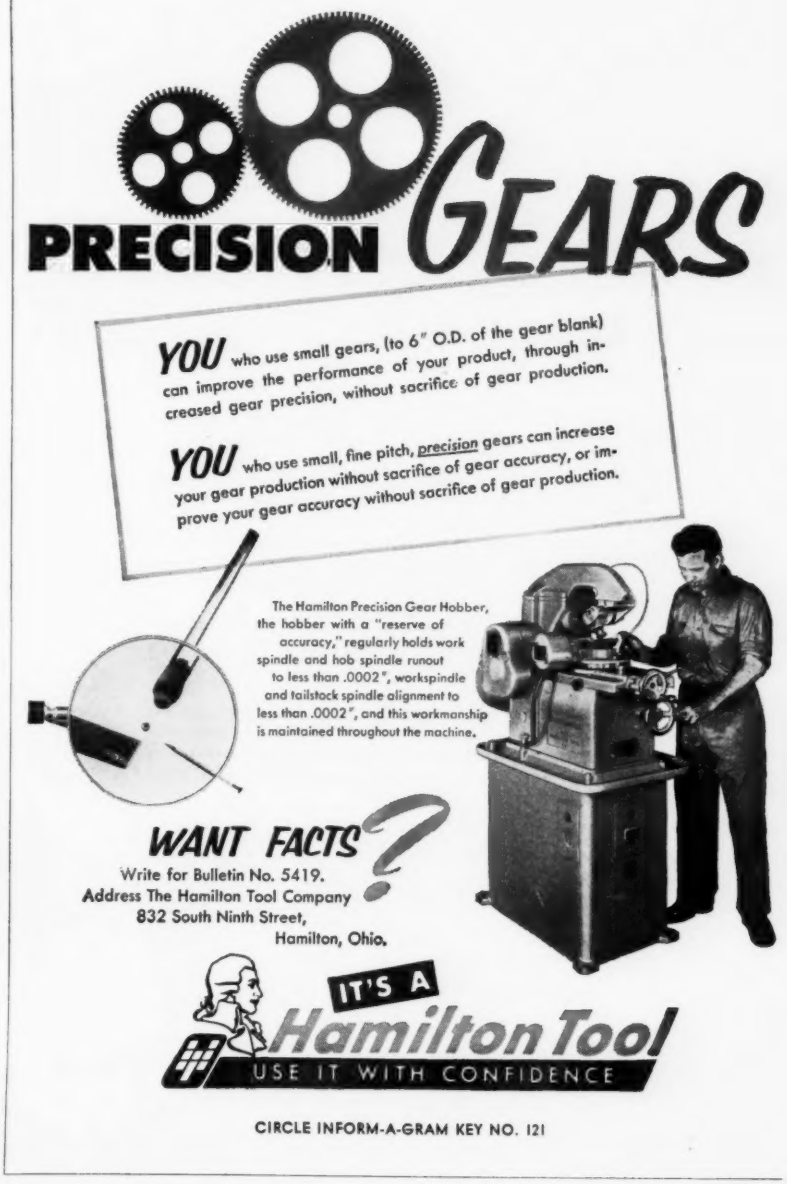
A Low-Cost Method of repairing worn, damaged and stripped threads is provided by the Tap-Lok repair kit. With the kit, the damaged threads can be repaired by drilling the hole and driving the insert. The inserts are self-tapping steel bushings, internally and externally threaded. The repair kit includes a quantity of inserts in the thread size chosen, a driving tool and instructions. Details are in a circular from Groov-Pin Corp., Ridgefield, N. J., or **Circle Inform-A-Gram No. B37.**

A Specially Designed Carbide Grade gives maximum performance and tool life. Firthite TXH, a new concept in sintered carbides, is a heavy duty, general purpose, steel

cutting alloy. A 4-page bulletin containing graphical charts and performance reports is provided by Firth-Sterling, Inc., 3113 Forbes St., Pittsburgh 30, or — **Circle Inform-A-Gram No. B38.**

19 Types of Power Conveyors for many applications are described in a new catalog. Included is size and dimension data plus installation photos showing the conveyors in operation. Portable, stationary, horizontal and inclined types of conveyors are shown. Also pictured are floor-to-floor conveyors, power belt corners, power roller curves and specialty items. Copies of Bulletin 302 can be obtained from Harry J. Ferguson Co., Jenkintown, Pa., or — **Circle Inform-A-Gram No. B39.**

Higher Frequencies, easy tool changes and ease and safety of maintenance are some of the features of a new induction hardening machine. The high frequency range permits rapid surface hardening of parts requiring shallow case depth and very narrow transition zones between case and core, as well as for any small or thin walled parts. Details are in Bulletin M-1938 issued by Process Machinery Div'n, The Cincinnati Milling Machine Co., Cincinati 9, or **Circle Inform-A-Gram No. B40.**


PRECISION GEARS
YOU who use small gears, (to 6" O.D. of the gear blank) can improve the performance of your product, through increased gear precision, without sacrifice of gear production.
YOU who use small, fine pitch, precision gears can increase your gear production without sacrifice of gear accuracy, or improve your gear accuracy without sacrifice of gear production.
The Hamilton Precision Gear Hobber, the hobber with a "reserve of accuracy," regularly holds work spindle and hob spindle runout to less than .0002", workspindle and tailstock spindle alignment to less than .0002", and this workmanship is maintained throughout the machine.
WANT FACTS?
Write for Bulletin No. 5419.
Address The Hamilton Tool Company
832 South Ninth Street,
Hamilton, Ohio.
IT'S A Hamilton Tool
USE IT WITH CONFIDENCE
CIRCLE INFORM-A-GRAM KEY NO. 121

Centralized Lubrication Systems. Accumatic Type II, are detailed in Catalog 34-20 from Stewart-Warner Corp., Alemite Div'n, 1826 Diversey Pkwy, Chicago 14. Covered are the basic parts of the system, methods of actuating Type II Accumatic systems, unit operation, supply line and lubricants data and installation procedures. Also given are line drawings showing how the manual or automatic systems serve single or multiple machines.
Circle Inform-A-Gram No. B41.

The Varied Applications of SR-4 devices and equipment are detailed in a 20-page bulletin. They're used to measure and control load, torque and fluid pressure. The bulletin tells how the devices work and their advantages. Detailed sections deal with load, pressure and torque. One section is devoted to instrumentation. Details are in Bulletin 4300 from Baldwin-Lima-Hamilton Corp., Testing Equipment Dept., Philadelphia 42, or —
Circle Inform-A-Gram No. B42.

Important Announcement

by HORTON CHUCK Since 1851

TO THE METALWORKING INDUSTRY

ON JULY 1ST, 1956, the Horton Chuck Division, Windsor Locks, Connecticut, became an operating Division of Greenfield Tap and Die Corporation, Greenfield, Massachusetts.

This step marks an important development in the history of these two companies, universally accepted as leaders in their respective fields.

"Greenfield" with its Ampco, Geometric and now Horton Divisions can offer to the metalworking industry the finest complete line of cutting tools and work holding devices obtainable.

The sales and distributor organizations of both Greenfield and Horton will continue to provide the excellent service which has been a hallmark in their years of continued growth and progress.

We take this opportunity to express our thanks to customers and friends of both companies for their fine acceptance and use of our products, and we pledge that the service and quality of which we are justly proud will continue to merit your patronage.

HORTON CHUCK · GTD AMPCO · GEO MET RIC · GTD

Greenfield Tap and Die Corporation
HORTON CHUCK DIVISION
WINDSOR LOCKS, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 122

Increase Machine Flexibility with a new line of Maureymatic variable speed transmissions. Speed change is made by moving a speed control

handle with no interruption in operation. Features and applications of four styles of the transmissions are described in catalog to be requested from Maureymatic Div'n, Maurey Mfg. Corp., 2915 S. Wabash Ave., Chicago 16, or—**Circle No. B43.**

Magnetic Perforating Dies that will perforate materials up to and including ¼" thick mild steel are available from S. B. Whistler & Sons, Inc., 748 Military Rd., Buffalo 23. Catalog M-55 shows the simplicity of setting up this magnetic equipment, in addition to covering the various type of units available. Also pictured are a few of the shapes of notches easily cut on a magnetic die set. Included in the catalog is a punching pressure chart.
Circle Inform-A-Gram No. B44.

Assemble Your Own Conveyor System with pre-fab Adapto Units produced by Logan Co., Louisville 6, Ky. A bulletin illustrates and describes the Adapto Units available and contains installation views and specifications. These stock-size belt and live roll conveyors are designed for fast shipment.
Circle Inform-A-Gram No. B45.

Hydraulic Pressure up to 10 Tons Maximum is provided by a hand-operated hydraulic bench arbor press. The pump is located on top of the press for easier pumping. Bulletin 104 describing the pump and listing the specifications and optional equipment is available from K. R. Wilson, Inc., Arcade, N. Y., or —
Circle Inform-A-Gram No. B46.

Blast Cleaning of Parts not economically handled in larger automatic equipment is performed by the EN-2 Cabinet. A bulletin describes the cabinet which is used for small or intermittent work, complete with 15 photos and drawings. Two tables present dimensions and specifications. For details, obtain Bulletin 607 from Pangborn Corp., Hagerstown, Md., or—**Circle No. B47.**

66 Models of screw cutting and turret lathes of advanced design are detailed in a new Lathes-Shapers-Accessories Catalog released by Logan Engineering Co., Lathe Div'n, 4901 W. Lawrence Ave., Chicago 30. In addition, the specifications are given for the line of 8" shapers. An 8-page section lists and describes the attachments and accessories that are available.
Circle Inform-A-Gram No. B48.

8 Different Tools for use on surface grinders are covered in an 8-page bulletin. Included are toolholders for power grinding, a magnetic holder, Squar-It clamping blocks, Sky-Hook, diamond holder, sine angle wheel dresser, portable demagnetizers and No. 1 radius emery wheel dresser. Montgomery & Co., Inc., 7 Tichenor Lane, Newark 5, N. J., will provide copies of the bulletin, or —
Circle Inform-A-Gram No. B49.

Increase Centerless Grinding Production 200% to 300% with the Feedcision automatic infeed grinding attachment. It is equipped with a variable position positive stop controlled by one simple set screw for removal of grinding stock from 0.005 to as much as 0.040 in one grinding cycle or pass. Contact Modern Devices, Box 492, Libertyville, Ill., for a circular with further information, or
Circle Inform-A-Gram No. B50.

22 Standard Types of Cost-Cutter Conveyors are produced by New London Engineering Co., New London, Wis. The company also custom builds the belt conveyors to meet

exact requirements. Bulletin 103 containing information and specifications to aid in solving conveyor problems is provided by the company, or
Circle Inform-A-Gram No. B51.

The Question, "What is Metal Spinning?" is answered in a brochure from Roland Teiner Co., Inc., 134 Tremont St., Everett 49, Mass. Also discussed are the principles of economical design, product design service, the experimental shop, form engineering, hot and automatic spinning, fabrication facilities and handling problem metals. For complete information get a copy of the brochure, "The Story of Metal Spinning," from the company, or —
Circle Inform-A-Gram No. B52.

Save Time, Improve Quality and cut costs with Fastex Plasti-Rivets. They permit application from one side only because they feature one-piece construction and are self-expanding. A bulletin shows some of their standard and special applications. Also given are dimensions, engineering data and hole size recommendations. For copies of Form AF-4, write to Fastex Div'n, Illinois Tool Works, 195 Algonquin Rd., Des Plaines, Ill., or —
Circle Inform-A-Gram No. B53.

PORTELVATOR®
The Handy HAMILTON Portable, Elevating Table

A PORTABLE HEIGHT-ADJUSTABLE TABLE
● TRUCK
● WORK BENCH

for
DIE TRANSFER
● MACHINE FEEDING
● ASSEMBLY AT BEST HEIGHT IN BEST LIGHT

LIFTING
● LOWERING
● TRANSPORT
of
SHEETS
PLATES
BARS
TUBES
PIPES
TOOLS
DIES
FIXTURES
●
ALL COMPACT HEAVY LOADS

UNOBSTRUCTED PERIMETER
●
WORK FROM ANY SIDE

MORE SERVICE for LESS MONEY than ANY Other Unit of Equipment

43 table surfaces
point support

LIFT LOWER TRANSPORT

FOUR-WHEEL and SIX-WHEEL MODELS

Recent changes and additions to the line provide greater capacities, new flexibility, *many bonus features.*

Write for NEW, FREE Bulletin P-5604

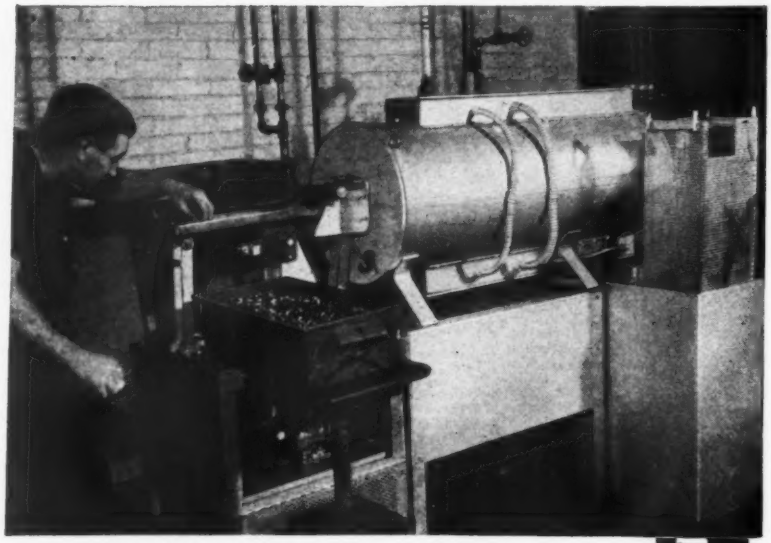
Address THE HAMILTON TOOL COMPANY,
832 South Ninth Street, Hamilton, Ohio

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE
5604

CIRCLE INFORM-A-GRAM KEY NO. 123

Speed and Accuracy of electronic computation is assured by Model 30 analog computer. This computer features "slide rule" operating simplicity. It is a basic tool for quantitative solution of a wide variety of physical and theoretical problems. Typical application, a general description, scope of application and specifications are presented in Technical Bulletin 302 released by Donner Scientific Co., 2829 Seventh St., Berkeley 10, Calif., or —
Circle Inform-A-Gram No. B54.

Unusual Applications of creative engineering and manufacturing work are described in a brochure from Garrison Machine Works, Inc., 515 Bannock St., Dayton 4. The company has solved many problems involving locating and holding nonsymmetrical or out-of-balance components during processing operations. Garrison will handle problems or ideas which a company wants developed into working form outside its own plant.
Circle Inform-A-Gram No. B55.



RAYMOND MFG. CO.
"Bright" Hardens Precison Springs in a HEVI DUTY SHAKER HEARTH FURNACE

"We bright harden carbon, vanadium, and stainless steel springs without distortion in our Hevi Duty Shaker Hearth Furnace," says the Raymond Mfg. Co. of Corry, Pennsylvania.

Hevi Duty standard Shaker Hearth Furnaces will carburize, nitride, dry cyanide or bright harden up to 150 lbs. of small parts per hour. Operation of this production machine is semi-automatic.

Write for bulletin HD-850 today.

HEVI DUTY ELECTRIC COMPANY
MILWAUKEE 1, WISCONSIN
Heat Treating Furnaces... Electric Exclusively
Dry Type Transformers *Constant Current Regulators*

CIRCLE INFORM-A-GRAM KEY NO. 124

Cut Time on Cuts and between cuts with the Mult-Au-Matic Type L vertical chucking machines. A catalog features a fold-out section which presents a large illustration of the

Type L machine complete with specifications and advantages. The catalog also gives the capacities for the various Type L Mult-Au-Matics available. The Bullard Co., Bridgeport 2, Conn., will make available a catalog with complete details, or — **Circle Inform-A-Gram No. B56.**

Miniature Flexible Couplings for power transmission are described in Bulletin MC-100 available from Thomas Flexible Coupling Co., Warren, Pa. Included are dimensional drawings of the couplings which can be used on servo-mechanisms, computers and other small devices. The couplings are designed for speeds up to 50,000 rpm and will compensate for parallel and angular misalignment.. **Circle No. B57.**

Universal Shearing and Forming Machines are highlighted in a catalog issued by American Pullmax Co., Inc., 2455 N. Sheffield Ave., Chicago 14. These versatile machines can cut circles, straight edges or squares and irregular shapes; bead; fold; slot; dish and cut louvers. They work both mild and stainless steels and non-ferrous metals.
Circle Inform-A-Gram No. B58.

No Finish Grinding Is Needed with Milford precision ground flat stock. It is available in a wide range of standard stock sizes with the edges ground parallel and accurately squared to the ends. It is produced in two types of steel — oil or air hardening. Information on the flat stock and the sizes available is found in a catalog sheet from The Henry G. Thompson & Son Co., New Haven 5, Conn., or — **Circle No. B59.**

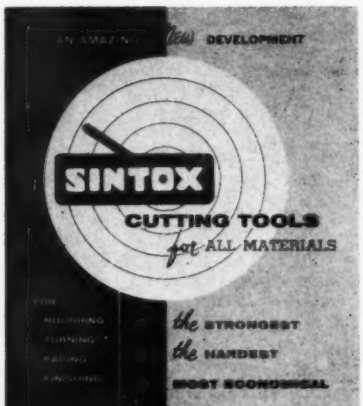
The Primary Considerations in designing a tape for efficient masking are stressed in a brochure describing three lines of all-purpose masking tapes. Two of the lines offer flexibility and the third is a flexible flat-back tape for extra strength. Copies of the brochure can be obtained by writing to Dept. T 2, Permacel Tape Corp., New Brunswick, N. J., or — **Circle Inform-A-Gram No. B60.**

A 50th Anniversary Catalog has been issued by Noble & Westbrook Mfg. Co., Westbrook St., E. Hartford 8, Conn. It contains the complete line of metal marking machines with illustrations of applications. Included are new marking machines capable of production speeds up to 15,000 pcs/hr with full automation and the Cyclomatic control. **Circle No. B61.**

"Engineered" Live Centers are described in Bulletin 256 released by Sturdimatic Tool Co., 3932 F St., Detroit 16. Given are specifications and prices of the standards made with Morse taper and includes three types of specials. More than 40 other live centers for specific purpose metalworking operations are illustrated in the bulletin. **Circle No. B62.**

Accuracy Less Than 0.0001" under load is a feature of J & S Perfection Free live centers. Their design provides an accurate, concentric, rugged and chatterless center for grinding and turning. Details and specifications are found in a bulletin issued by J & S Tool Co., Inc., 87 Dorsa Ave., Livingston, N. J., or — **Circle Inform-A-Gram No. B63.**

Maximum Tool Performance at all speeds and feeds is possible using Sintox ceramic cutting tools. They are used for roughing, turning, facing and finishing of all material. Included is a photo of special products



and fixing and grinding instructions. Sintox Corp. of America, 270 E. Hamilton St., Allentown, Pa., will supply copies of a bulletin on Sintox cutting tools, or — **Circle No. B64.**

Solid Tungsten Carbide Pusher Pads have a life expectancy of more than 30 times that of steel pads. Their bearing surface is non-scratching, non-wearing, and non-galling. These pads are designed for the standard Balas Model "A" master pushers, but a wide variety of standard sizes are available for use on most makes of machines. For complete information, get Bulletin CP-156 from Balas Collet Mfg. Co., Cleveland 14, or — **Circle Inform-A-Gram No. B65.**

Wide Grip Range, Positive Hole Fill, high clinch and uniform stem retention are features of the Versa-Rivet. It simplifies inventories since the grip range is sufficiently wide that one shank length is satisfactory for all thickness of material handled by any rivet diameter. For copies of Bulletin TL-118 with specifications, design details and lists of proper guns and heads for applying them, write to Townsend Co., P. O. Box 237-Z, New Brighton, Pa., or — **Circle Inform-A-Gram No. B66.**

To form, dress or touch up wheels *in a jiffy*

GET one of these light, easy-to-grip, dressing sticks from your local NORTON distributor and keep it handy in your tool box. You'll find it's just what the doctor ordered for cleaning up a wheel face, forming a radius or touching up a tool wheel in a jiffy.

With a NORBIDE Dressing Stick you can see more of the wheel face and avoid costly overdressing. And it will greatly reduce dust nuisance too.

Better yet, a NORBIDE Stick of Boron Carbide — the hardest man-made material commercially available — will outlast hundreds of ordinary sticks. Order one today or write for Form 1567 giving more details.

NORTON COMPANY, 47 New Bond St., Worcester 6, Mass.

NORTON BORON CARBIDE

Next to the diamond in hardness . . . available at a fraction of diamond cost

CIRCLE INFORM-A-GRAM KEY NO. 125

Count the Cycles of Power Line Frequency to control welder sequence with an electronic counter welder control. A bulletin divided into two sections discusses the development of welder control and the specific features of the Dekatron type welder control. Sections deal with centralization of welder functions and how additions of extra welder function is simplified. Bulletin 338 can be obtained by writing to Sciaky Bros., Inc., Public Relations Dept. L-10, 4915 W. 67th St., Chicago 38, or — **Circle Inform-A-Gram No. B67.**

High Alloy Castings in Mechanized Heat Treating Equipment are discussed in a brochure from Alloy Casting Institute, Mineola, N. Y. Although the story is concerned entirely with one company's heat treating operations, basic principles involved in design and application of high alloy castings in various atmosphere and high temperature conditions are explained. Copies of "Materials Handling at High Temperature Mechanized with Cast High Alloy Heat Treating Parts," can be obtained from the Institute, or — **Circle Inform-A-Gram No. B68.**

COMPARE!

NEW

Eclipse®

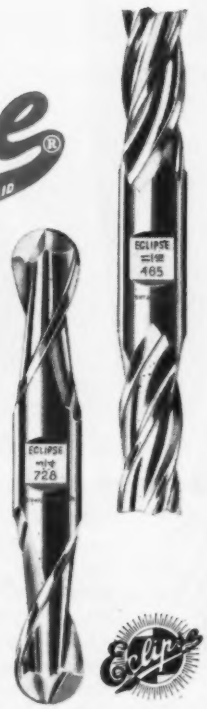
PRECISION GROUND from SOLID

END MILLS

with

Conventional

END MILLS



Our END MILLS have an entirely new and advanced flute design with an uninterrupted contour and hook from one flute to the next.

Flutes ground from solid hardened blanks with mirror finish allow a smooth flow of chips. Identical flutes as to dimensions and contour give a perfect distribution of cutting load. The form relieved land provides much greater strength to the cutting edge.

RESULTS: longer tool life, finer finishes, and lower production costs.

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ECLIPSE COUNTERBORE COMPANY

DETROIT 20, MICHIGAN

END MILL DIVISION—NORTH BRANCH, N. J. (ADDRESS BOX 97, RARITAN, N. J.)

CIRCLE INFORM-A-GRAM KEY NO. 126

Faster, Safer, More Economical Production is possible with Federal open-back, inclinable presses. They are offered in four major classes: standard, dial feed, air clutch and special presses. The presses are

available in a wide range of capacities. Details, construction and operating features and specifications are included in a catalog from The Federal Press Co., Elkhart, Ind., or — **Circle Inform-A-Gram No. B69.**

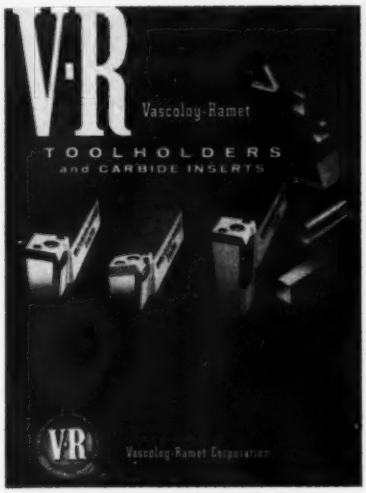
Better Production at Less Cost is possible with the Bellows air motor. A bulletin tells what the motor is, how it works and what it does. The various types of air motors available are illustrated and described. These motors are produced in a wide range of mounting styles. Also covered are auxiliary control units. Contact The Bellows Co., 222 W. Market St., Akron, O., for your copy of Bulletin BM-25, or — **Circle No. B70.**

The Screwmatic 750 is detailed in a catalog released by Gear Grinding Machine Co., 3901 Christopher, Detroit 11. One section describes subassemblies and another shows and explains 10 design features. Also discussed is the new "unit construction" principle of this single spindle bar automatic screw machine. The catalog is complete with pictures, cross-sectional diagrams, cutaway drawings and specifications. **Circle Inform-A-Gram No. B71.**

Removal of Fragmentary Burrs from finish machined cast iron or non-ferrous parts by the Burr-Blast method is discussed in a 4-page bulletin. Three basic designs are described. Included are typical parts that have been Burr-Blasted and a description of the various blasting materials. Request copies of Bulletin BB-1 from Modern Industrial Engineering Co., 14230 Birwood Ave., Detroit 38, or — **Circle No. B72.**

Sleeves and Sockets, and Turret Toolholders are the subject of Bulletin 7-50 available from Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8. The bulletin gives the specifications for these tools and points out their features which provide strength, resistance to wear and sustained accuracy. **Circle No. B73.**

A Complete Line of Toolholders and Carbide Inserts is featured in Catalog VR-437 released by Vascoloy-Ramet Corp., Waukegan, Ill. Included are illustrations of various



styles of toolholders to replace standard brazed carbide tools plus dimensions, prices and ordering information for toolholders and carbide inserts. **Circle No. B74.**

Unitized Hole Punching and Notching Equipment is highlighted in the latest catalog from Punch Products Corp., 3800 Highland Ave., Niagara Falls. Described and illus-

trated are Unipunch Series A and B, Series AE and Series C hole-punching units and Uninotch Series A and B notching units. Included are price lists, specifications and engineering data. **Circle Inform-A-Gram No. B75.**

What Timing Can Do for You is pointed out in an automation booklet. Covered are various types of reset and repeating cycle timers. Each type is illustrated and described. Contact Eagle Signal Corp., Moline, Ill., for copies of Booklet D1-1, or — **Circle No. B76.**

Facing Heads with automatic feed are featured in a bulletin from Mummert-Dixon Co., Hanover, Pa. Shown are applications of the heads to horizontal boring mills, drill presses and lathes. Included is a description of the heads, their specifications and a diagram with half section and overall dimensions. **Circle Inform-A-Gram No. B77.**

Industrial Furnaces, Ovens and Kilns are featured in a catalog published by L & L Mfg. Co., 136 8th St., Upland, Pa. The furnaces and kilns have temperatures to 3000°F. The catalog includes price lists, features, illustrations, line drawings and specifications. **Circle No. B78.**

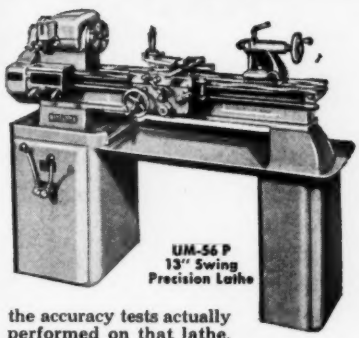
SHELDON Precision LATHES

for the size Lathes You Need Most

Sheldon lathes are built in the sizes you need most, for toolroom and production jobs. They are available with swings of 10", 11" and 13". . . in varying bed lengths with 18" to 48" center distances . . . and . . . in your choice of pedestal, cabinet or bench mountings.

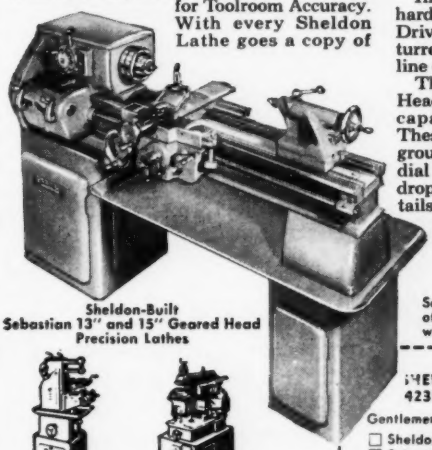
Powerful, all-V-belt, drive units—either the standard 8-speed (or 16-speed) E-drive; or the production favorite, a rapid, lever-shift U-drive. Where higher spindle speeds are desired, the standard E-drive can be built to provide speeds up to 2,000 r.p.m.

All Sheldon Lathes have handscraped, built-in precision. Each lathe is guaranteed to meet or surpass the American Standards for Toolroom Accuracy. With every Sheldon Lathe goes a copy of the accuracy tests actually performed on that lathe. (19 checks).


UM-56 P
13" Swing
Precision Lathe

Important optional features include: hardened bed ways, L00 Long Taper Key Drive spindles, 4" D1 Camlock spindles, bed turrets, taper attachments and a complete line of toolroom and production accessories.

The new Sheldon-built Sebastian Geared Head Lathes have greatly increased work capacity and many advanced features. These include a wide, heavy, hardened and ground bed . . . easy shifting spindle speed dial . . . 60-pitch gear box . . . independent drop lever apron clutches . . . cam-action tailstock clamp . . . and, automatic lubrication in the headstock and apron with "1-shot" lubrication of carriage.


Sheldon-Built
Sebastian 13" and 15" Geared Head
Precision Lathes

SHELDON
Horizontal Milling Machine

SHELDON
12" Shaper

SHELDON MACHINE CO., Inc.

Builders of Sheldon Lathes, Milling Machines, Shapers and Sebastian Lathes.

4235 N. Knox Avenue • Chicago 41, Ill.

Send in coupon or write for catalogs and names of nearest Sheldon and Sebastian Distributors where you can see these new lathes in operation.

SHELDON MACHINE CO., INC.
4235 North Knox Ave., Chicago 41, Illinois

Gentlemen: Please send new catalogs describing:

☐ Sheldon ☐ 10", ☐ 11' ☐ 13" Lathes
☐ Sebastian 13" and 15' Geared Head Lathes
☐ Horizontal Milling Machine ☐ Name of Local Dealer
☐ Sheldon 12" Shaper ☐ Have representative Call

Name ..... Title .....

Company Name .....

Street Address ..... ☐ Company ☐ Home

City ..... State .....

CIRCLE INFORM-A-GRAM KEY NO. 127

John Erbach is serving as sales engineer for Warner Electric Brake & Clutch Co. With headquarters in Milwaukee, Mr. Erbach is handling sales and service of the company's products in eastern Wisconsin. Prior to joining Warner, he was with the Mack Truck Corp. and Athens Canning Co.

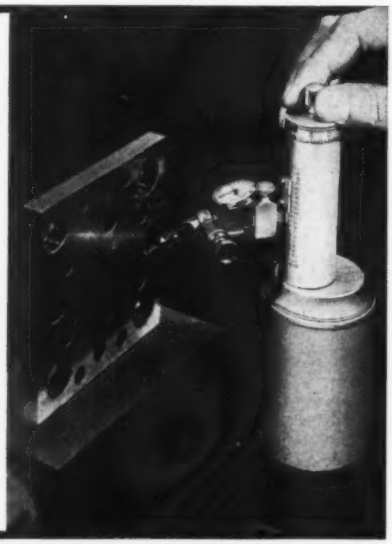
The appointment of **T. J. Clark** as northwest division manager for Atkins Saw Division, Borg-Warner Corp., has been announced. Mr. Clark who will headquarter at the Portland branch office and warehouse, will supervise Atkins sales and shipments in the northwest division.

◆

The position of special sales engineer for The Reliable Spring and Wire Forms Co. is filled by **John P. Tracey.** His primary responsibility is serving northwestern Ohio and part of Cuyahoga County, but he is available for customer service over a wider area.

CUT INSPECTION TIME!

Micro-Height Gage reads faster than a micrometer! You measure from zero at base to 3". Hundredths on barrel...*thousandths* on big head that cuts reading time. Add dial indicator and you quickly measure between holes, surfaces.



GREIST MICRO-HEIGHT® GAGE

CUT LAYOUT TIME!

Easy-reading Micro-Height measures and scribes faster than any vernier gage... with less chance of error! Risers give you ranges to 9". Accurate Micro-Height, finished in satin-chrome, quickly pays for itself!

Call your distributor or write

THE GREIST MANUFACTURING COMPANY, 488 BLAKE STREET, NEW HAVEN 15, CONN.

Precision Products since 1871

CIRCLE INFORM-A-GRAM KEY NO. 128

Phillip E. Gordon has been promoted to district manager of the Los Angeles sales district by Latrobe Steel Co. He will supervise the company's sales in California, Oregon and Washington.

◆

Richard H. Kline has been added to the metal processing department sales staff of Pennsylvania Salt Mfg. Co. He will work under the direction of district sales manager, **Charles R. Sorber,** handling Pennsalt products for the metal producing and metalworking industries in the Detroit area.

◆

Homer L. Gibbs is a field engineer at the St. Louis office of Norton Co. Since 1953 he has been an instructor in the Norton school of grinding.

◆

The new manager of the equipment sales department of Brush Electronics Co. is **Donald E. Pierce.**

◆

James T. Roberts has taken over as sales division manager for the Cleco Division of Reed Roller Bit Co. in its north central sales area. He has had over 10 years experience in the air tool industry. Division headquarters are in Chicago.

◆

The election of a vice president and appointment of sales managers in two divisions were disclosed by Kearney & Trecker Corp. **J. Robert Jones** is the new vice president in charge of sales. The sales manager of the standard machinery division is **H. W. Kippers** and a similar post in the special machinery division is filled by **Carl F. Enroth.**

◆

H. L. Tigges has been appointed consulting sales engineer for Buhr Machine Tool Co. He formerly had his own consulting engineering firm.

◆

The new manager of tool steel sales for Crucible Steel Co. of America is **A. H. Lewis.** He has his headquarters in Pittsburgh.

◆

Harry E. Mitchell has joined Metallurgical Products Department of General Electric Co. as a Carboloy tool sales representative in the midwestern district. His headquarters will be in Tulsa, Okla.

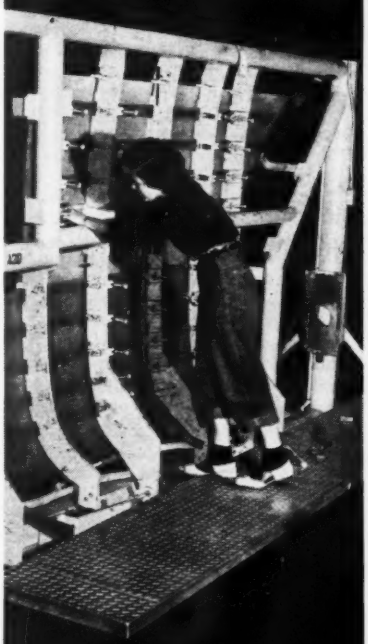
◆

Richard D. Keller is the assistant sales manager of the machine tool division of Pratt & Whitney Co., Inc. He joined the company in 1930.

◆

William L. Martin has been named sales manager for Potter & Johnston Co., according to an announcement by **J. Potter Cunningham,** company president and general manager. Mr. Martin joined the firm in 1928.

A tooling problem?



INVESTIGATE

RED METALS CO. SEAL

ALUMINUM TOOLING PLATE

Many industries are profiting from the outstanding advantages of machinability, low cost, lightweight and corrosion resistance made possible by Red Seal Aluminum Tooling Plate and Bar Stock.

Investigate the advantages of low cost Red Seal Plates and Bars for your tooling requirements.

Call or write for this new Red Seal Aluminum Products Brochure.

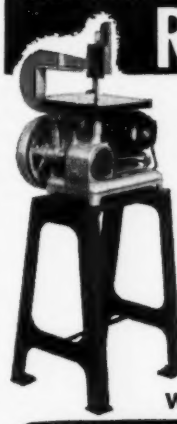
Eastern Distributor:
Aluminum Division of
Atlantic Steel and Iron Co.
Page Boulevard, Springfield, Mass.
Phone: REpublic 9-9611

RED SEAL METALS CO.
10035 Burtis Street
South Gate, Calif., LOrain 6-5105

CIRCLE INFORM-A-GRAM KEY NO. 1291

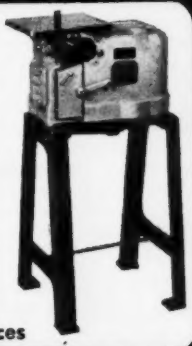
Smoother Production! Higher Output! Lower Costs!

RICE-MILWAUKEE



DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.



PROFILE GRINDERS

. . . for high speed Precision Grinding of Curved and Irregular Contours.

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

Write for Illustrated Bulletins and Prices

RICE PUMP & MACHINE COMPANY
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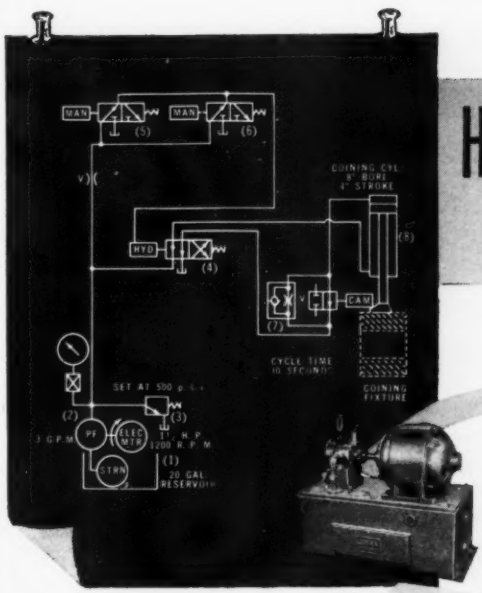

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New Techniques in Manufacture Revealed at Machine Design Conference

One of the outstanding activities of the Cleveland Engineering Society over the past 13 years has been the annual Machine Design Conference. This conference is regarded as the most significant meeting of its type to be held by a local engineering society in the country.

Attendance at each succeeding conference has grown to the point where the number who wish to attend exceeds the capacity of the Society's present facilities. However, efficient committee planning has always met the situation.

Predicting Machine Performance

The importance of knowing what to expect from a machine in the way of performance, to meet the present day demand for high precision machined parts, was emphasized at the 1956 Conference by William H. Nahm, Quality Control Engineer, Brush Electronics Co.

He pointed out that every part of a machine must have clearance and clearances increase with wear; the moving parts must be lubricated and the thickness of the lubricant varies with temperature, pressure, and contamination; tools and stops are subject to wear; and the operator himself is a source of many variations.

For these reasons the design and production engineers require accurate knowledge of a machine's performance, so that they may establish the most economical compromise between the ideal design and a practical product.

Mr. Nahm demonstrated a standard quality control method for predicting machine performance, by showing how a sample of five consecutive pieces is taken from the machine run, at regular intervals, and the required dimension or dimensions recorded. From these data $\overline{X}$ (average of readings) and $\overline{R}$ (average range) values are determined. These values are sufficient to establish the limits within which 99.7% of the product of the machine will fall.

What We Expect of Machine Builders

Standardization was the keynote of the talk by John J. Holmes, Supervisor, Equipment and Operations, Production Engineering Section, General Motors Corporation.

Using defense work as one example, he cited the need for standardized work space for machines of similar types made by different manufacturers. If in case of hostilities with a foreign power, some of our plants were damaged or totally destroyed, then salvaging and moving of equipment to resume production would be simplified if there were more standardization between makes of equipment.

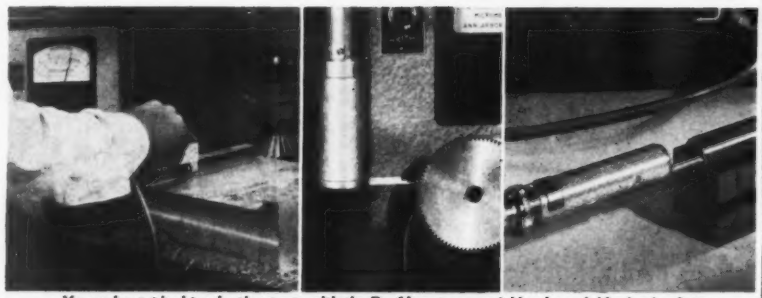
In normal peacetime, machine standardization is desirable at General Motors because equipment is frequently moved from one division to another.

The various manufacturing committees of General Motors are active in many outside activities to promote standardization, among which is participation in JIC Standards and the ASA.

Standardization of many machine tool parts and accessories of competitive manufacture is quite desirable. One example of this need is grinding wheel hole sizes. These have been standardized by General Motors so that where 22 hole sizes had been used, now 12 are used. In order to accomplish this, a standard wheel mount has been designed to be used within General Motors' plants.

The internal dimensions on wheel mounts have to be made to fit the

Eliminate Production Operations!



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particular grinding machine on which the mount is to be used. General Motors would like to see grinding machine manufacturers standardize their wheel spindles, so that a wheel mount could be changed from one make of grinder to another.

Some divisions of General Motors have been successful in buying machines built to G.M. Standards. This is particularly true of the Bearing and Stamping Divisions.

Developing a Creative Imagination

Training design engineers in the art of creative thinking has met with success at the General Electric Company, according to Addison E Wiles, Manager, Equipment Engineering Sub-Section, in his talk on creative imagination.

In setting up the training course at General Electric, it was organized as the Creative Approach Seminar in which each step in working out a problem is spelled out.

The program began with only two steps — the problem and solution. This developed into a four-step approach, (1) definition, (2) search, (3) evaluation, and (4) solution. Although this proved a whole lot more workable, it was weak in some areas when it was applied to the more technical types of problems.

The problem approach is now organized under eight steps. The first thing that is done is to recognize that there really is a problem, and to understand the need that is to be answered.

The first step is then Recognize. This is not the same as defining the problem, which is the second step. To define the problem is to describe in basic terms the nature, the function, and the limiting specifications of the machine which is to answer the recognized need.

The third step is a search for methods to meet the specifications arrived at in step two. This is really the first effort toward the solution of the problem. As this is the stage for uninhibited creativity, for brainstorming, for the massing of dozens of ideas — good ones, bad ones, old ones, new ones, silly ones even . . . but, above all, free positive untrammeled ideas.

Judgment or the critical faculty has no place in step three, but it does come in step four — Evaluate. Thus, the fourth step is to evaluate the list of ideas from step three. The usual thing is that no one idea proves to be the answer; rather, several combine to make one composite practical suggestion.

Step five is to select the most promising basic idea out of the half dozen or so that the evaluation process is likely to have left. This finishes the idea work toward the solution.

Step six is to produce a preliminary design.

Step seven is to demonstrate the machine.

Step eight is to follow through the working feasibility of the solution and the refining of the machine.

Looking Ahead in the Development of Automated Machine Tools

In discussing "the ability of automated machine tools to cut costs," Leo P. Gajda, Director of Engineering, Snyder Tool and Engineering Co., Detroit, pointed out that this is recognized throughout industry. Also, that it is the automated machine tool which has continually raised production output potentials for a given floor space. In addition to cutting materials handling operations to a minimum, these modern machines make more uniform parts with a minimum of scrap.

He cited the progress in the development of automated machines from the early transfer types, wherein the parts were placed in fixtures and the fixtures were automatically moved from operation to operation. In other types, transfer bars moved the parts from operation to operation where they were clamped automatically in stationary fixtures at each station.

The latest developed "machine" consists of six separate and distinct machine tools, thus carrying machine segmentation to a high degree.

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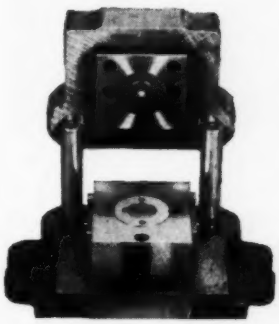

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Parts are fed from machine to machine by individual transfer mechanisms instead of the more or less conventional transfer bar. The transfer mechanisms raise parts up an inclined chute by a pusher bar. The parts fall by gravity to an escapement. Here parts can be infed manually or stacked up vertically for inter-machine storage.

From the escapement, the parts are moved up another inclined chute where they feed into the next machine. The first machine is a trunnion-index machine from which the machined parts are automatically unloaded and placed in a transfer mechanism.

Individual control panels are provided for each of the other machines which perform a variety of operations.

Numericord Control

Research and experimentation were responsible for combining two control systems into one — the Numericord Control. Harry E. Ankeney, Manager, Research, and Kenneth S. Jensen, Senior Electrical Engineer, Giddings and Lewis Machine Tool Co., gave the procedures followed in integrating the M.I.T. Servomechanism and the General Electric magnetic tape machine control into the Numericord Control.

This machine control has been built for heavy duty industrial service and in particular for controlling the machining of complex frame and skin shapes for the aircraft industry.

In addition to controlling the feeds of the machine, the Numericord system also controls on-off functions. This includes functions that are ordinarily initiated by a pushbutton or limit switch such as turning coolant on and off, setting or releasing clamps, and stopping the tape transport.

Additional channels on the tape are used for these functions, a signal being recorded wherever a particular device must operate. Several functions can be controlled from a single tape channel by using signals of a different frequency for each function. Thus, the magnetic tape has complete control of the machine. It not only controls the movement of all of the machine feeds but also performs essentially all of the other functions normally performed by the operator.

The position of each feed is checked against the recorded program 400 times per second and any error in its position initiates instant corrective action in the control. The movements are therefore continuous and not by steps. Thus smooth, three-dimensional curved surfaces as well as simple flat surfaces may be machined.

The Engine Plant Story

John F. Anderson, Manager of Industrial Engineering, Engine Division, Chrysler Corporation, gave a detailed description of the procedures followed in building the Mound Road Engine Plant for production of Plymouth overhead valve V-8 engines.

For the benefit of our readers, the editors are of the opinion that, rather than brief this story, we refer the reader to "The Plymouth Story" which was published in the October 1955 issue of TOOLING & PRODUCTION.

Other speakers on the program were:

Erwin K. Taylor, President, Personnel Research and Development Corporation and now a TOOLING & PRODUCTION contributing editor. His subject was "What to Expect of an Engineer and Why."

Webster Brumbaugh, Assistant Director of Sales Development, Hinde-Dauch Paper Co., who spoke on "Packaging Automation".

Jay H. Bergen, Standards Administrator, American Machine & Foundry Co., whose subject was "Simplified Drafting".

* * *

Editor's Note:

Complete text of all talks and proceedings of the 13th Annual Machine Design Conference are available from Cleveland Engineering Society, 2136 East 19th St., Cleveland 15. $1.00 per copy.

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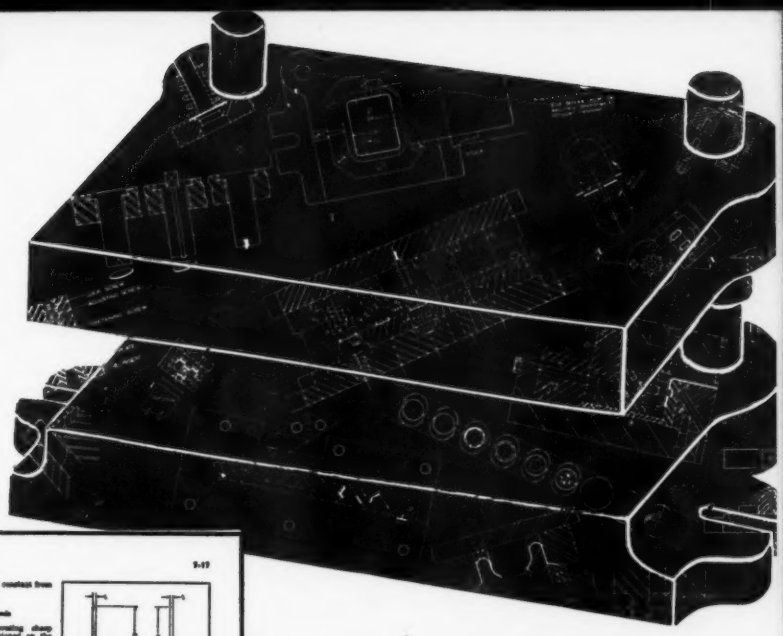

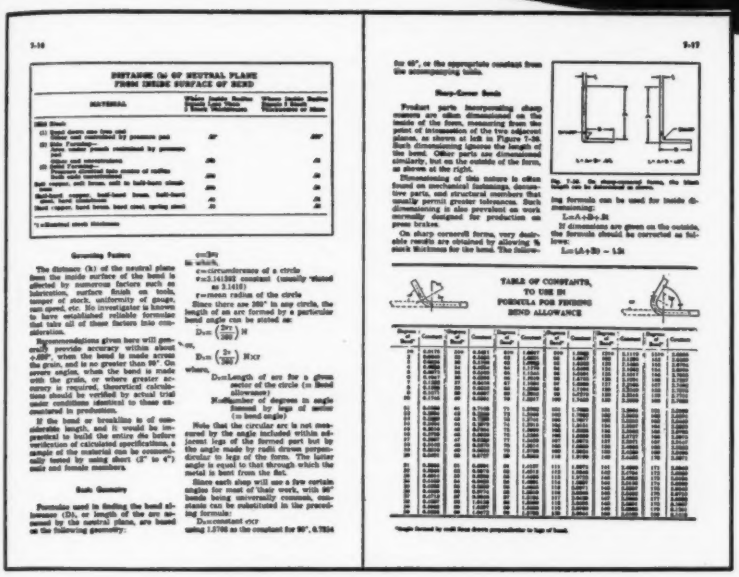

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MEN YOU SHOULD KNOW

Charles M. Reesey has been elected a vice president of Cincinnati Milling and Grinding Machines, Inc., sales subsidiary of The Cincinnati Milling Machine Co. He has been advertising manager for the parent company since 1934. Another new vice president is **A. H. Dall.**

◆

Wallace S. Berry has taken over as director of research for the automotive division of American Motors Corp. The company's new director of engineering is **R. H. Isbrandt.**

Coordination of engineering work at all branches of Pioneer Engineering & Mfg. Co. is under **S. Paul Burns** who is the new chief engineer. He has been with the company over 13 years.

◆

Carl Halpin has been appointed manager of engineering at Ross Operating Valve Co. He joined the firm with more than 30 years of engineering and manufacturing experience.

Several appointments in Manufacturing Services have been disclosed by General Electric Co. **Thomas N. Willcox** is the new senior equipment engineer and **Theodore E. Poliakoff,** senior coil manufacturing engineer. **Walter P. Sime, Jr.** has become inspection engineer-gauging and equipment in Quality Control Service. In the Distribution Assemblies Department, **Charles J. Falk** has been named manager-engineering, replacing **R. C. Wilson** who has taken over as manager-marketing. **Lloyd H. Mattson** has become manager of the materials sub-section of the Metallurgical Products Department.

◆

Donald S. Kellogg has been named chief engineer of the Avionic Engineering Division at General Precision Laboratory. **William H. Heath** is the new assistant chief engineer. The new post of director of research is filled by **Dr. George R. Gamertsfelder** and that of chief product engineer by **Otto J. Kolb.** A special planning staff has been formed under the direction of **Donald S. Basim.**

◆

The election of **Charles H. Crawford** and **W. W. Wood** as vice presidents of Colonial Broach & Machine Co. has been disclosed by **Arvid O. Lundell,** president.

◆

The Jarvis Corp., as part of a general expansion program, has announced the appointment of **Andrew E. Josephson** as production manager and director of purchasing of Jarvis Power Tools, Inc., a subsidiary. He has been associated with the firm since 1937.

◆

John A. Matousek is the new assistant to the president of Baker-Raulang Co. In his new capacity, Mr. Matousek aids on general staff problems and handles special assignments in fleet sales, new market and product programs and industrial relations.

◆

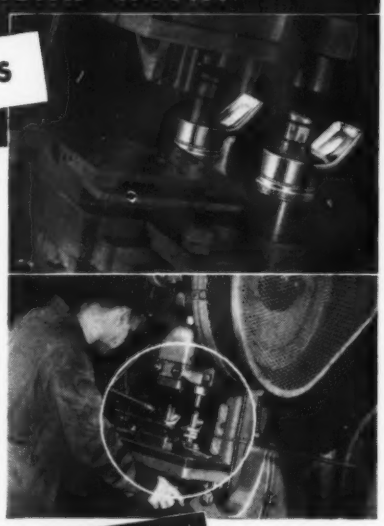
E. D. Ronketti has moved into the position of manager of the San Jose, Calif. plant of American Can Co. Mr. Ronketti, a 27-year veteran in the can-making industry, replaces **H. A. Hjorth** who has been assigned to the company's International Division in New York.

◆

Thomas E. Darnton has taken over as purchasing agent for the Oldsmobile Division of General Motors Corp. He succeeds **Harold J. Hidlay** who retired in May.

USE THESE **ACRO** ACCESSORIES TO ELIMINATE WEAR WITH:

LEADER PIN OILERS



Eliminate wear on your die sets with these leader pin oilers. Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminate bushing wear, leader pin scoring, and maintain die accuracy. Die sets equipped with Acro Pin Oilers have run under tests for several weeks to a month without refilling.

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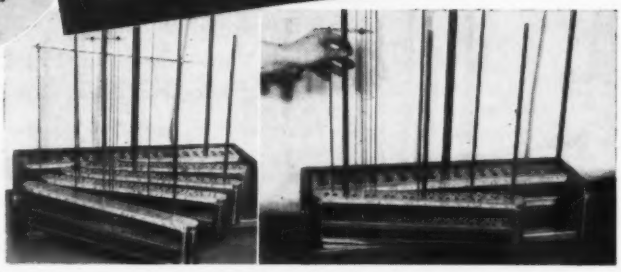

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MEN YOU SHOULD KNOW

Edward N. Clark is now the assistant to **Edward J. Shages,** factory manager of the Cutting Tool and Gage Divisions of Pratt & Whitney Co., Inc. The new superintendent of the Cutting Tool Division is **Ralph Winspear.** Mr. Clark has been with the company 36 years and Mr. Winspear joined the firm in 1928.

◆

Bruce M. Sheffer is serving as manager of advance manufacturing, engineering at Carboloy Department now Metallurgical Products Department of General Electric Co. He formerly was at the Mercury Division of Ford Motor Co.

◆

Lawrence L. Garber has been named to the newly created position of vice president in charge of production for H. K. Porter Co., Inc. He will supervise production for the firm's 13 divisions with offices in the Pittsburgh headquarters. He will be succeeded as general manager of Henry Disston Division by **Eugene Salinger.**

◆

R. O. Peterson has been elected vice president of Brush Division — Engineering, Osborn Mfg. Co. In his new capacity, Mr. Peterson will assume increased responsibilities in the company's accelerated program of research and development on power brushing methods and brushing machines. He has been with the company since 1936.

◆

Harry Goenner has been appointed quality control manager for all plants of Proctor Electric Co. In this position, Mr. Goenner assumes full responsibility for quality control of Proctor products manufactured in the company in both the manufacturing and service divisions. He has been with the company for 19 years.

◆

Hugh F. Colvin succeeds **Philip S. Fogg** as president of Consolidated Electrodynamics Corp. Mr. Fogg is continuing as chief executive officer in control of general company policy. In his new position, Mr. Colvin is responsible for general management of the business.

◆

The new manager of manufacturing at Fenwal Inc. is **James R. Keough.** He is responsible for production, manufacturing methods, quality control, standards and systems and purchasing activities for the manufacture of precision temperature controls and overheat detectors.

Vincent Matner has joined Fischer & Porter Co. as chief product engineer. He is responsible for production design of all the company's mechanical and electro-mechanical products and components.

◆

The new president of Firth-Loach Metals, Inc. is **William J. Loach.** He succeeds **L. Gerald Firth** who continues as director. **M. A. Cancelliere** has assumed the responsibilities of vice president in addition to his duties as board chairman.

Joseph P. Chayka has been named chief engineer at Detroit Broach & Machine Co., according to an announcement by **Gustav von Reis,** president. Before joining the company, he was employed by Michigan Broach Co.

◆

Appointment of **James Vincent Huebner** as assistant manager of the application engineering department of Formsprag Co. has been announced by **Charles F. Trapp, Jr.,** vice president in charge of sales.

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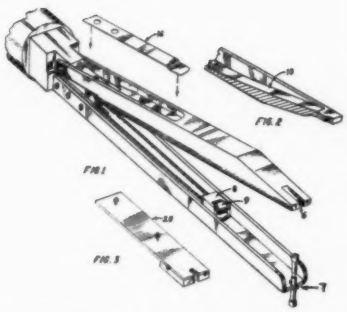
Cherry Rivets Set by New Air Actuated Puller

A cherry rivet puller for setting flush or universal-headed rivets in near-inaccessible places has been developed by Chance Vought Aircraft to handle special jobs on supersonic planes.

The puller works somewhat like an alligator's jaws, in reverse. At the tips of its 10" jaws are indentations (Nos. 6 & 7). After the cherry rivet has been set in place, the puller tip (No. 7) is placed over the rivet head and the puller tip (No. 6) grips the upper end of the rivet stem. Inside the two jaws is an air cylinder-actuated block (No. 8) which is pushed toward the tips, expanding the jaws and setting the rivet.

The block is equipped with rollers (No. 9) to cut down friction as it moves forward to spread the tips. Jaw expansion is possible because



the inner surface is inclined as it nears the tip (No. 10), making possible thinner and less massive jaws.

A spring (No. 14) is added to the top of the movable jaw to close it as the actuator roller is retracted. Since the momentum of the movable jaw could overcome the bending strength of the spring and damage adjoining structure, the spring is cut to such length that when the jaw is fully open the spring acts in compression, limiting further opening.

It would be possible to change sizes of rivets by having three basic interchangeable movable jaws and separate inserts (No. 20) to snap onto the fixed jaw. These tips also could be used to convert from flat to brazier head rivets.

During the pulling of a rivet, the force required gradually increases to a maximum at the end of the operation until the puller stem snaps off. The length of the lever arms of the jaws from the rollers (No. 8) to the slots (Nos. 6 & 7) gradually decreases during the pulling of the rivet. This provides increasingly greater pulling or tension force as required. This permits thinner jaws and the setting of rivets in many normally inaccessible locations.

Invention of the tool by Marion C. Goolsbee, tool research engineer, and James L. Sylvester came at a time when Chance Vought was called on to perform a minor but difficult modification to planes scattered all over the world. A number of the tools were constructed and rushed to Navy installations, enabling the rivets to be set with a large saving of man-hours for mechanics.

The research branch of Aluminum Co. of America officially has been named Alcoa Research Laboratories. It is the world's most complete light metals research facility. Since its founding in 1918, ARL has stood for Aluminum Research Laboratories. However, a broadened scope of activities prompted the name change.

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Series Fifty ½ HP 65 GPM
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NYLON SOLVES TUBE BENDING PROBLEMS

Metallic tubes for aircraft, from ¼" to over 2" dia, must be bent to various configurations, maintaining their inside diameter, and preventing collapse. Because tubing is produced in a range of wall thicknesses and diameters, bending operations on a production basis have presented a difficult problem.

Douglas Aircraft Co., Inc., Santa Monica, Calif., has met this problem by developing three types of nylon tube bending mandrels, machined from Polypenco rod stock supplied by The Polymer Corp. of Pennsylvania, Reading, Pa.

For heavy wall or smaller tubings, a bullet type mandrel, Figure 1-A, is inserted to a spot just below

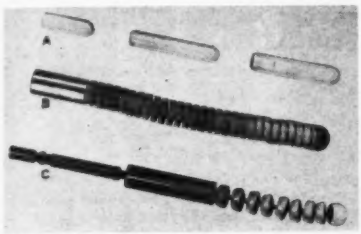
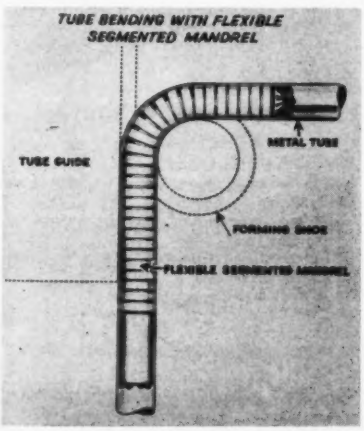


Fig. 1. Three types of nylon bending mandrels are used at Douglas Aircraft Co.: (A) bullet type; (B) flexible segmented type; and (C) flexible ball type.

the point of bend and remains stationary as the tube is drawn. The flexible segmented type, Figure 1-B, is used for bending thinner wall or larger diameter tubing, which is more collapsible. More frequently used than the bullet type, it is inserted in the tube and travels with the tube around the forming shoe, Figure 2.

A segmented ball mandrel, Figure 1-C, of 1" dia costs only one-third as much fabricated from nylon as the original polished steel. In addition, the nylon mandrel was cut, formed

Fig. 2. Segmented nylon mandrel traveling with tube during bending operation.

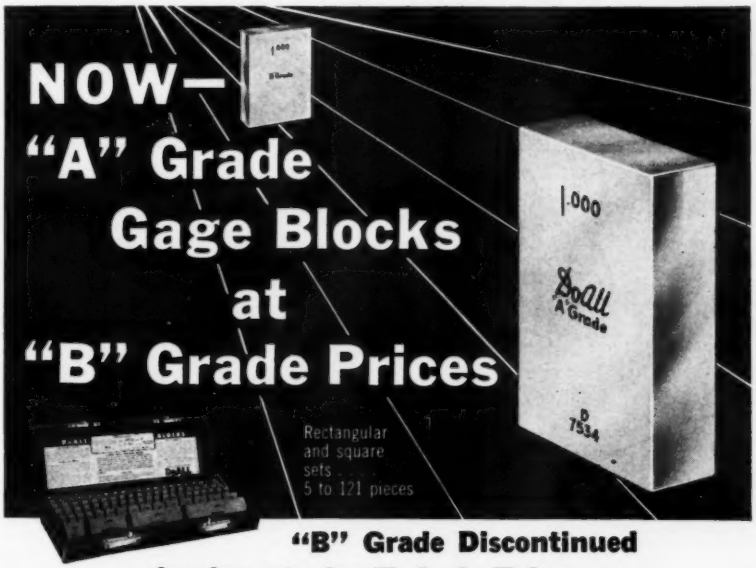


and assembled by Douglas in 5 hrs, whereas the original steel mandrel required 7 days for delivery.

Douglas reports that nylon possessed the desired combination of properties of abrasion resistance, high tensile strength, resiliency, and low coefficient of friction to make the change desirable.

The abrasion resistance of the nylon permits long wearing. At the same time, its natural resiliency allows the mandrel to deform slightly, distributing the load during the bending cycles, reducing chattering and vibration. Nylon's low surface friction eases the insertion and removal of the mandrel and minimizes the drag during the drawing operation. Polypenco nylon's high tensile strength prevents tearing of the mandrel during the bending operation.

The segmented mandrel is made up of a number of discs or ball shaped segments with a center hole. A flexible steel cable is threaded through these segments to form the complete mandrel. The machining of the segments is conveniently performed on standard metalworking equipment.



"B" Grade Discontinued as Inadequate for Today's Tolerances

Prevent measurement errors, save time, save money and pay no premium: DoALL "A" Grade gage blocks, with guaranteed tolerances of plus .000004, minus .000002 per inch of length are now available at "B" Grade gage block (± .000008) prices!

Every set accompanied by a Certified Inspection Report showing calibrated size of each block! Precise calibration made possible by guaranteed 0 to 0.09 RMS surface finish. Superior finish also eliminates abrading action . . . extends useful life of block. Exclusive "burr-proofing" of edges minimizes chance of damage.

Get the facts—find out why "B" grade blocks cannot do today's measurement job. Call your local DoALL Store or write:

FREE—New DoALL Gage Block Catalog listing square and rectangular gage block sets in "A", "AA" and new "AAA" grades. Set sizes range from 5 to 121 blocks. Accessories for assembling fixed or indicating gages. Write today!

FREE—"How to Be Your Own Bureau of Standards"—new 36 page manual on shop inspection and calibration of gage blocks—describes equipment and methods needed to inspect blocks for flatness and wear as well as for accurately calibrating your blocks. Call or write for your copy.

The DoALL Company, Des Plaines, Illinois

Machine Tools · Cutting Tools · Measuring Instruments · Tool Steel

CIRCLE INFORM-A-GRAM KEY NO. 137

SOMMA STANDARD circular form tools make MORE PROFIT

Now you can save time and money on a wide variety of form tool operations by replacing costly made-to-order or hand ground tools with *Somma Standard Circular Form Tools.*

In addition you are assured of uniform accurate dimensions every time, easier set-ups, and a better finish on the parts.
And *Somma Standard Tools* are available through the Somma representative in your area.

Write for new catalog and price list of standard tools and blanks.

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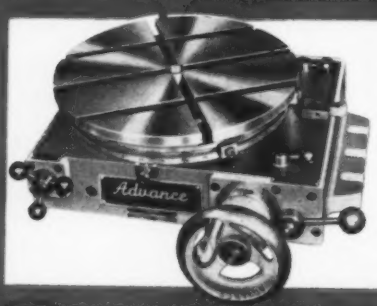
30 Seconds Accuracy



ADVANCE 15" ROTARY TABLE

This rugged, precise tool is designed for all types of work requiring rotational accuracy. Its maximum speed and precision, and minimum maintenance fills the need for a precision unit at a moderate price.

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MORRISON ENGINEERING COMPANY

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Full 1/3 h.p. G. E. Motor

USE IT EITHER WAY

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use **$89.95**

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A few desirable distributor territories still available.

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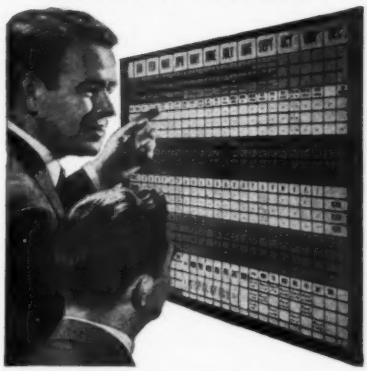
CIRCLE INFORM-A-GRAM KEY NO. 1383

How To Get Things Done Better And Faster



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CIRCLE INFORM-A-GRAM KEY NO. 1384

GROWING PAINS

TEMCO Aircraft Corporation will build a one-million-dollar engineering center near its Garland plant. When the new facility is finished next spring, all engineering functions will be moved there. The building with an area of over 100,000 sq ft, will provide facilities for administration, design, ultra-modern laboratories and a high bay area for experimental work.

◆

Raytheon Manufacturing Company has purchased a 15-acre site in Goleta, Calif., for a new engineering laboratory to be used in the designing and development of airborne electronics and infrared equipment. This 35,000-sq-ft building will be completed in the spring of 1957.

◆

An eight-million-dollar expansion to its plant capacity for manufacturing arc welding machines and electrodes has been announced by **The Lincoln Electric Company.** Work is underway to complete two million dollars of the project by the end of the year. The company is also building new plants in France and Australia to replace the present ones and is adding to its Canadian plant.

◆

Valenite Metals Corporation will expand plant facilities to triple its present size. The company produces tungsten carbide tips and tools.

◆

Plans for expanding physical facilities by almost 100% have been disclosed by **Induction Motors Corporation.**

◆

A 22,000-sq-ft addition to **National-Standard Company's** plant has been completed. The firm manufactures tire bead wire, high carbon flat steel, wire cloth, special machinery and a variety of fine wires.

◆

Manufacturing facilities at the East Pittsburgh plant of **Westinghouse Electric Corporation** will be expanded and improved this year in a program costing over $1,000,000. The expansion will be made in the plant's transportation and generator division and will be handled as two projects. The first project consists of installing new equipment and rearranging facilities and the second will provide additional capacity for the production of large generators.

The present plant capacity of **Formsprag Company** will be doubled with the construction of a new addition which will be finished by Sept. 15. The company is the world's largest exclusive manufacturer of sprag clutches for over-running, backstopping and indexing applications.

◆

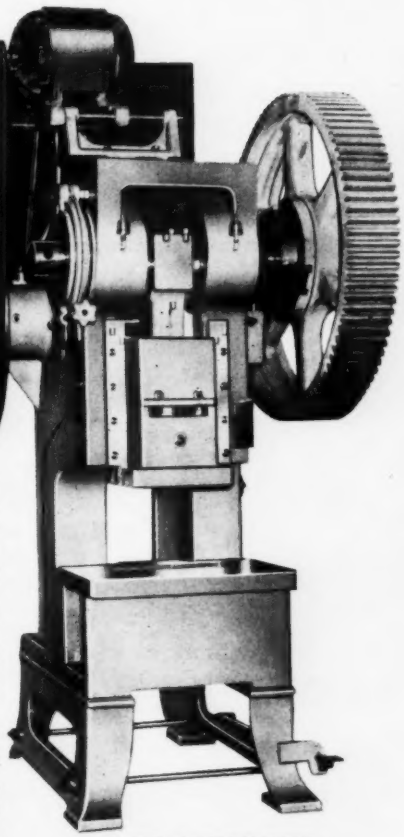
A two-story structure with 20,000 sq ft of space is being constructed to enlarge the plant facilities of **Datamatic Corporation.** The firm is engaged in the development and production of large-scale electronic data processing systems.

A new addition to the Melrose Park, Ill. plant of **Lindberg Steel Treating Company** will provide a 60% increase in productive capacity as well as additional shipping and receiving facilities. The new plant which will house several specialized metal heat treating processes, will be completed early next year.

◆

D. C. Fonda Gage Company has opened a new plant in Stamford, Conn. James R. Hanlon is serving as general sales manager. The firm produces "ultra-finish" rectangular and square gage blocks in steel and carbide with accessories.

PERKINS
HEAVY DUTY
Blanking
Presses



This Model A press is the best type of press for heavy blanking work. It is built with eccentric shaft, short stroke and the center line of the shaft in line with the center of the ram and gibways. This construction makes a press that works with effortless ease and the absence of crashing that usually accompanies heavy work on gap presses. Ranging in size from 3 to 200 tons, this Model A press will give you more machine for your money than other types of construction.
For more efficient press performance we also offer many features, such as — Air Clutches, Automatic Brakes, Oiling Systems, Single and Double Roll Feeds and Dial Feed Attachments.

NO. 9 MODEL A GEARED PRESS

Send for new illustrated Model A Bulletin.

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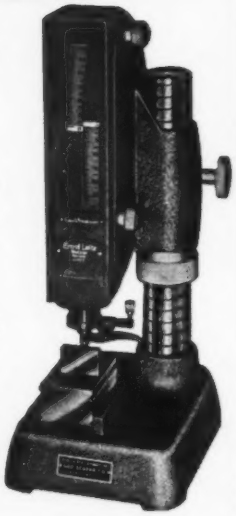
PRESS BUILDERS FOR OVER 50 YEARS

CIRCLE INFORM-A-GRAM KEY NO. 139

LEITZ OPTI-COMPARITOL

An amplifying gage of semi-optical design for gaging outside dimensions, lengths and thicknesses precisely and rapidly.



Its unusual design makes it sensitive enough for the finest tool and gage inspection, with the necessary ruggedness for fast, day in - day out - production inspection.

Brightly illuminated screen makes the readings unmistakable at a glance. Adjustable red tolerance shield shows undersize pieces and green tolerance shield shows oversize pieces.

If it's White - It's Right

Reads in .00005" - Range ± .005" Capacity 6"

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In certain territories inspection may be arranged

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CIRCLE INFORM-A-GRAM KEY NO. 1401

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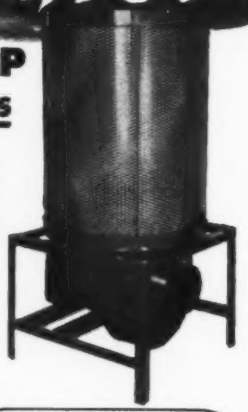

with MISTKOP VAPOR COLLECTORS

Efficient—low cost—compact MISTKOP vapor collectors can be quickly installed and easily maintained. wherever collection and control of industrial vapors are necessary. MISTKOP vapor collectors save costs in recovered coolants—keep walls, windows, ceilings clean of excess moisture—eliminate fire hazard from uncontrolled vapor. There is a MISTKOP collector to meet *your* requirements. Write for illustrated folder today.

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YESTERDAY'S PIONEER . . . TODAY'S LEADER

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60° - 82° - 90° - 100° ANGLES

CHATTERLESS

Large Center

Greater ease in cutting and longer life are the outstanding features of these WELDON tools for countersinking and deburring operations. Chatter is eliminated because of the single cutting edge. One trial will convince you.

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WELDON Distributors throughout U. S. A. and Canada carry complete stocks to serve you.

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CIRCLE INFORM-A-GRAM KEY NO. 1402

Portable Surface Analyzer Checks Finish at Machine

Manufacturers are discovering that considerable waste can be cut from the finishing operations by checking surface finish right at the machine, instead of in the inspection department. This practice eliminates the rejection of parts because of too coarse a finish. Equally important from the economic standpoint, it reduces another common loss, excessive finishing beyond the point necessary for proper functioning.

It has been found that portable finish inspection instruments used at the machine are actually production tools. Their use makes it possible for the operator to set up his machine for proper tooling, speeds and feeds, to produce optimum results. It also permits frequent quality checks during a production run, and thus provides prompt warning if the finish fails to meet specifications.

Surfindicator is used to check shaft surface finish, while the shaft remains in the machine.

The portable instrument illustrated is the Surfindicator manufactured by Brush Electronics Co., Cleveland 14, a division of Clevite Corporation. It weighs only 15 lbs. and can be moved to any part of the plant, quickly and conveniently. It is used to measure surface roughness of metal, plastics, glass and vitreous ware, ceramics, paper and other materials.

Because it is designed as a portable instrument that goes to the work, the Surfindicator has been built to high standards of ruggedness and strength. Even though it is moved from place to place frequently, it will retain its accuracy and sensitivity. The dial is calibrated in terms of the new ASA specifications. The instrument can be used on flat or curved surfaces, or to measure the internal finish of bores.

'Universal' Alloy is Navy's Latest

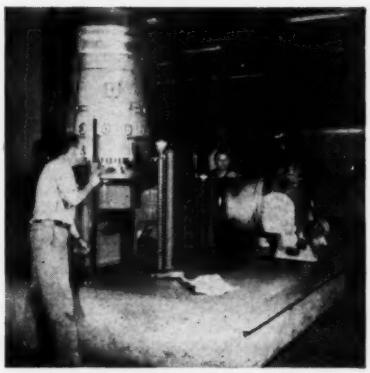
The Navy reports development of a "Universal" alloy with some amazing properties. Most important is the fact that Thermenol contains no strategic or critical metals.

The new alloy is superior to presently used alloys for heating units in toasters, hot plates, and electric ranges. It is 20 to 25% lighter than stainless steel and possesses better tensile strength at high temperatures. Corrosion and oxidation resistance are excellent and Thermenol's extremely good magnetic properties make it preferable for use in transformers and tape recorder heads.

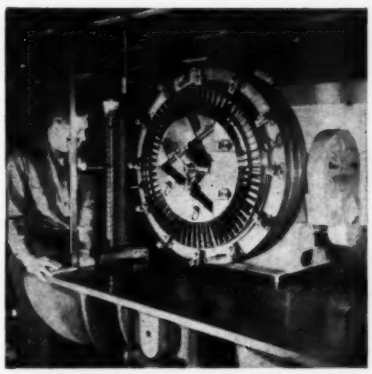
Because of its high tensile strength even at 1200° F, Thermenol offers great promise as a replacement for stainless in the turbine blades of jet aircraft engines and other applications where temperature and corrosive atmospheres are problems. The metal retains a mirror-like high gloss polish indefinitely.

ROTABS Beat Precision Inspection Costs...

This 24" ROTAB plus centering fixture cuts checking time for 11 dimensions on six vane segments from several hours to 5 minutes each.



Checking big jet engine assemblies is fast and simple on ROTABS (36" & 48"), eliminates costly fixtures made obsolete by engineering changes.



Seconds-of-arc precision allows quick, accurate inspection with low cost standard gages. Here 36" powered unit checks vane spacing.

For small parts inspection this 12" universal ROTAB minimizes setup and inspection time, does not require power for tilting and rotation.

For complete data on the optical precision readings you get with the ROTAB at the lowest cost, write:

MACHINE PRODUCTS CORP.

6771 East McNichols Road . Dept. C . Detroit 12, Michigan

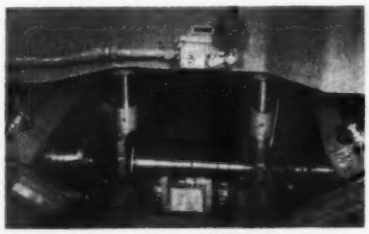
CIRCLE INFORM-A-GRAM KEY NO. 141

A New Concept in Center-Lapping

An entirely new concept in center-lapping high production parts was demonstrated recently in a completely automatic machine.

In operation, parts are fed from a conveyor onto an inclined magazine loader, then set automatically in the workholding fixture, hydraulically clamped, center-lapped on both ends, and ejected onto the unload truck at the rate of 300 pcs/hr.

This new machine, engineered and developed by Industrial Metal Products Corporation of Lansing, Michi-



gan, employs two "IMPCO" center-lapping units. Each is equipped with an automatic dresser which dresses the stone after each cycle, or as required, and resets itself for amount of stone removed. The units are also equipped with automatic control panel lights that flash on when stones have been used to minimum length, and to indicate that the machine has shut off and reset itself for new stones.

Close-up view shows the loading and unloading tracks with the part clamped in the workholding fixture and stones advanced to the part. Parts are lapped with coolant.

Micrometer adjustment dials are provided to adjust stones on initial setup.

Bearings, Inc. . .

takes sick, worn out or damaged High Speed Grinder and Precision Boring SPINDLES and makes them NEW again . . . in HOURS . . . not weeks

Above is our Spindle Repair "doctor" checking the "heartbeat" of a rebuilt spindle with a stethoscope. He's listening for sounds of rubbing seals or any uneven tone at various speeds that might spell bearing trouble in the making.

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Gentlemen:

Please send me complete information on your spindle repair and rebuilding service.

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City_____ Zone_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 142

Engineers Predict More Stainless in Supersonic Planes

Fifty percent or more of tomorrow's supersonic planes will consist of stainless steel, predict Republic Steel Corporation engineers. The appearance and "cleanability" of the metal will have almost nothing to do with its selection because many of the stainless components will be deep within jet engines or frame, where they will never be seen. Its ability to resist corrosion and heat and still maintain strength, and its ability to take and retain a smooth surface finish are reasons for its widespread use.

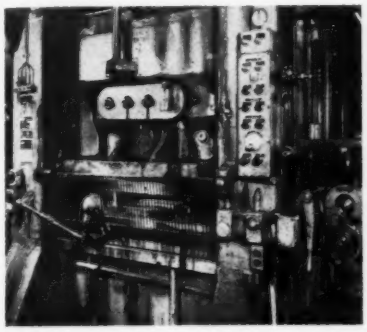
Among the present-day plane's stainless members, probably the smallest is a tiny needle bearing for moving parts of instruments in the pilot's compartment. In power plants, stainless parts include fire walls, heating units, and exhaust collector rings. Some other miscellaneous parts are used for de-icing equipment, control members, and major structural parts of landing gear. One jet now in production has more than 1,000 lbs of stainless in its main section and another 600 lbs in the after-burner.

With stainless fast becoming a leading metal for aircraft, the technology of fabricating it and selecting the proper type for given uses becomes a new specialty. Republic Steel is one producer with field metallurgists in the field to advise applications, fabrication methods and design techniques. The company recently increased its stainless steel manufacturing facilities by 18%.

New Type Press and Carbide Dies Double Production

A leading producer of fractional and small horsepower electric motors has increased production of laminations by 130%/press/day, since installing presses designed specifically for high production operation.

Each of the seven Danly Autofeed presses, built by Danly Machine Specialties, Inc., 2100 S. Laramie St., Chicago, produces 230,000 pcs per day (three shifts), compared to 100,000 pcs per three shifts with presses used previously.



The manufacturer uses only carbide dies (progressive, 6-station) in the Danly Autofeeds which were designed and built especially for high production jobs like this one. Die life of the carbide dies on these presses is 1,000,000 pcs between grinds. The stock used is 2¾" and 3-1/16" x .057 hot rolled silicon steel, on coils for automatic feeding.

CO_2 Shield Offers Amazing Economies

Carbon dioxide costing only one cent/cu ft in comparison to approximately seven and nine for helium and argon, shows great promise in the welding field.

To help industry realize this saving, the Welded Products Division of the A. O. Smith Corp., Milwaukee, Wis., has designed a unit called C-OMANUAL. This compact portable equipment consists of a hand gun, a control unit, and a special A. O. Smith 600-amp DC power source.

An operator's innate inability to hold a constant arc length is diminished by automatic current compensation. This feature alone enables many jobs to be handled without costly jig and fixturing, heretofore necessary to hold a constant distance between work and the wire.

With a uniform arc, back burning and stubbing are eliminated; high metal deposits of sound quality, excellent strength, good ductility, and deep penetration are reported.

Flux is not used, consequently slag removal is done away with giving a clean non-porous weld.

Wire speeds up to 600 ipm, and a lightweight gun make the use of this equipment as fast or faster than any semi-automatic equipment available.

The gun features "no O ring" design, which eliminates gas leaking and helps keep maintenance to a minimum.

All necessary controls are conveniently provided for optimum performance and welding ease.

The intermeshing sleeves support the punch throughout its entire length. Result?

1. **The Punch CANNOT buckle**
2. **The Punch CANNOT shift off center**
3. **Perforates thru metal many times thicker than hole diameter.**

All Durable Punches are vertically lapped, then electrocoated — Result—easier stripping, no galling, longer punch life.

Because Durable's research department constantly finds answers to difficult piercing problems—thousands of customers DEPEND ON DURABLE.

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Whatever your piercing problem may be — DURABLE'S know-how and 18 years experience offers a quick, economical solution. Write today for full details on any piercing problem. You'll get a fast, practical reply from the most DEPENDABLE Punch and Die Manufacturer in the World!

IF IT'S DURABLE IT'S DEPENDABLE

Patented and made exclusively by

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1214 W. Madison Street, Chicago 7, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 143

Scrap Handling Economized with Dumping Hoppers

A messy, time-consuming salvage procedure has been turned into a neat, one-man operation, and has made scrap segregation practical by switching from wheelbarrows and scoops to self-dumping hoppers at Verson Allsteel Company in Chicago.

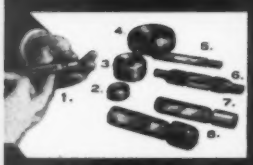
Verson has to contend with steel filings, turnings, cuttings and other scrap in manufacturing their line of stamping presses. Previously, several men were tied up for hours collecting the scrap with wheelbarrows and scoops and making it ready for pick-up by scrap dealers.

Switching to self-dumping Roura hoppers has made it a one-man operation. The worker shovels the scrap into several dozen hoppers. Then he uses a forktruck to cart the hoppers to semi-trailers outside. When a handle of the hopper is tripped it dumps itself, returns to an upright position, and is then forktrucked back to its station.

Use of hoppers, according to John Novak, Verson's executive vice president, has made it economically practical to segregate scrap, thus increasing its value. Work areas are departmentalized according to metals used, and hoppers are assigned to each department.

Taft-Peirce Gages have the Bargain *Built Right In!*

Here are two exclusive reasons why your best buy is always Taft-Peirce Fixed Gages: precision lapping and Electrolizing. Precision lapping eliminates "hills" and "valleys" which cause rapid wear — makes the gage accurate much longer. Electrolizing deposits an extremely hard, dense, non-magnetic alloy on all gaging surfaces, giving exceptional wear resistance, extremely low coefficient of friction, and high resistance to corrosion. Now you can get fixed gages with a much greater life span . . . and the slightly extra cost actually pays for itself! Ask for the Taft-Peirce Handbook showing the complete line of gages and tool-room specialties noted for that extra money-saving "Life-Value". Call your nearest T-P representative or write: The Taft-Peirce Manufacturing Co., Woonsocket, R. I.



These will cut your Fixed Gaging Costs

1. Double-end plain cylindrical plug gage
2. Spline ring gage
3. Plain ring gage
4. Thread ring gage
5. Double-end thread plug gage
6. Reversible thread plug gage
7. Single-end plain cylindrical plug gage
8. Single-end thread plug gage

The Taft-Peirce Family — AIR GAGES • PRECISION GAGES MAGNETIC CHUCKS • TOOL-ROOM SPECIALTIES GRINDING MACHINES • LAPPING MACHINES

TAKE IT TO TAFT-PEIRCE

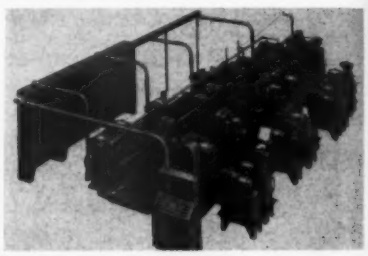
THE TAFT-PEIRCE MANUFACTURING CO. WOONSOCKET, R. I.

T-P Means TOP Precision

Transfer Machine Includes Latest Developments

This machine embodies many important features, such as, 1) sectionalized bases to facilitate process changes, 2) mist lubrication of spindles to maintain a constant temperature in the heads, 3) spindles arranged for pre-setting of the cutting tools, 4) automatic overall lubrication, 5) and automatic inspection features.

The Buhr Economatic has other design advantages to aid the maintenance department: the machine parts are standard throughout, for complete interchangeability; JIC electrical and hydraulic construction was strictly adhered to; and the ways are steel, hardened and ground.



This integrated unit performs 62 operations on 200 torque converter housings an hour. It has 12 stations, is 42' long and was built by Buhr Machine Tool Co., Ann Arbor, Michigan.

NUMERICAL CONTROL IS SPECIALTY OF NEW MASSACHUSETTS FIRM

The newly-formed Concord Control, Inc. of Cambridge, Mass., specializes in developing and manufacturing numerical control equipment for machine tools and industrial processes.

Most of the firm's engineers played responsible parts in the development of the numerically controlled machine tools at the Servomechanisms Laboratory at Massachusetts Institute of Technology.

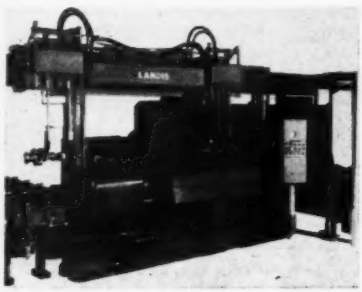
Newly-elected officers of Concord Control, Inc. include President James O. McDonough; Herbert P. Grossimon, vice president in charge of engineering; and Richard W. Lawrie, vice president in charge of sales.

STANDARD MACHINES MERGE TO EMBRACE AUTOMATION

Unlike the previous, manually loaded, interrupted cycle, crankshaft pin bearing grinding machines, this Landis production line unit is continuous and automatic.

The automated unit consists of four standard Landis crankpin grinding machines integrated and synchronized electrically, hydraulically and mechanically.

Before each grinding machine of the unit a storage area in the form of a conveyor supplies parts for subsequent grinding. Each conveyor holds a quantity of crankshafts, which permits any machine to be inoperative for wheel change or maintenance while the others continue to operate from their storage conveyor.



Illustrated here is one station of a four station crankshaft grinding machine built by the Landis Tool Co. One crankpin of the total of four is ground in each station to complete the shaft.

In case of a shutdown of any machine of the unit that machine's portion of the work on the crankshaft is handled in an auxiliary manual machine, outside the automatic group.

Parts are moved successively from conveyor, to machine, to conveyor, etc., by loading arms. The loading arms position the workpiece into the chuck which does not clamp until a gaging finger has first checked the longitudinal position.

As the parts are checked automatically between stations (machines) a machine is stopped automatically if its work fails to pass inspection. Gages show correction necessary and the machine is not started again until correction is made, to enable it to grind to size.

Tie-in controls allow loaders to operate only if there is a crankshaft ready for loading and if there is a vacant space on the next conveyor to deposit a finished shaft.

The automation line automatically gages in process and out of process (between stations) as well. With this inspection system, diameters are ground to predetermined sizes within limits of .0005". Diameters, widths and taper are checked.

The Landis Tool Co., of Waynesboro, Pa., announces that the system is complete with all the safety devices necessary to prevent damage to machines or workpieces. Grinding wheels cannot move while loaders are in operation. Crank carrying fixtures cannot revolve until a shaft is in position, clamped, and loader arms retracted.

year after year

Biggest in Volume Sales

for tough die sinking!

Raise the Feed . . .
Reduce Die Costs with

T-J CUTTERS

T-J Cutter at work on a Cincinnati 16" Vertical Hydrotel. Insert design Die Sinker.

Whether you have new machines or older types in your die and forge shop, you'll be ahead in *accuracy and production* with T-J Die Sinking Milling Cutters! T-J Cutters are *extra sturdy*... reduce die costs...preferred everywhere!

Designed for speed, accuracy and long life . . . less breakage . . . more work between grinds! Made from an extremely high grade steel . . . properly machined . . . scientifically heat-treated and accurately ground. Wide range of styles and sizes. Send for new catalog No. 1055. The Tomkins-Johnson Co., Jackson, Mich.

T-J

TOMKINS-JOHNSON

MILLERS, AIR AND HYDRAULIC CYLINDERS, CUTTERS, CLINCHERS

39 Years Experience

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HEATS FAST SAVES TIME

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NO. 142 HEAT TREATING FURNACE

Start heat treating high speed and carbon steels while other furnaces warm up. Powerful burners in this efficient furnace get heat up to 1300°-2350° F. range in minutes. Temperatures accurately and quickly regulated. Ratchet-operated door opens upward — no need to open fully every time. High temperature refractory-lined firebox keeps heat uniform — 7" by 13" by 16½". 200,000 BTU's per hr. Carbofrax hearth, G.E. Motor and Johnson Blower included ..... F.O.B. Factory, $337.00

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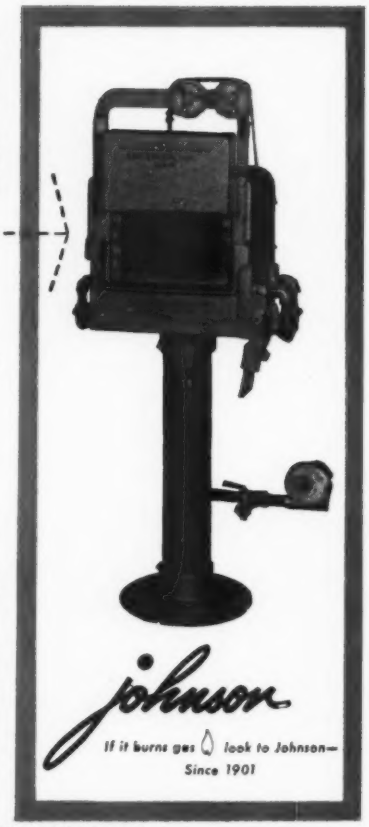
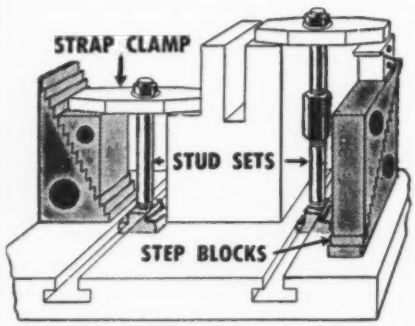


CIRCLE INFORM-A-GRAM KEY NO. 1461



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Clamping tools of all types.

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DRESEL-BETZ CO.
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Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings.

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DESIGNERS AND BUILDERS
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NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, Bedford 2-2800. Tooling, Short Run Production and Machined Parts for Automation.

A. P. SCHRANER & CO.
3338 Payne Ave., Cleveland, O., HEnderson 1-8644. External Cylindrical Lapping Machines. Special Machinery, Tools, Dies, Jigs, Fixtures.

JIG BORING

and

Large Precision Machining

Done to your specifications

We Have
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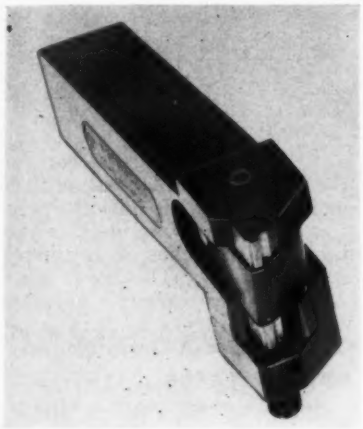
KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1464

INDEXABLE CARBIDE INSERT TOOL CUTS SHALLOW GROOVES

A line of indexable carbide-insert Multicut tools designed for all types of shallow grooving cuts, has been introduced to the metal working industry. Except for the insert itself and the locking bank of the Multicut holder, all parts of the holder are of standard design.

Developed by the Wesson Company, 1220 Woodward Heights Blvd., Ferndale 20, Michigan, the new tools have wide application in the automotive, electrical, and other fields. Automotive transmission shafts, for instance, may incorporate as many as five or more shallow grooves.



The inserts are modified Wesson-metal D-80 inserts and may be used in 4 positions (2 for each end) before requiring resharpening. Compared with conventional single point grooving tools, major savings in tool cost are reported in field tests.

There are 3 principal reasons for these savings:

1. Once set in their holders, these tools are always "on size" for depth and width since the insert is merely indexed in the holder to present a new sharp cutting edge. Set-up time and machine downtime are thereby reduced materially.
2. Grinding costs are significantly lower because of the 4 edges per insert and the elimination of the need for form grinding; only the top and bottom of the insert need be ground to present 4 new sharp cutting edges.
3. More regrinds are possible since regrinding does not affect the critical tolerance on width of the grooving tool.

Insert shapes and dimensions are ground to meet the standards required by customer's manufacturing operations.

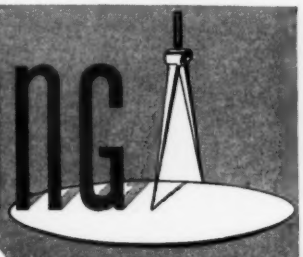
FLUID POWER GROUP ELECTS OFFICERS

J. J. Pippenger, vice president of Double A Products Company, was elected president of the National Fluid Power Association at the organization's annual meeting recently.

Assisting him are R. J. Murphy, sales manager of the Kalamazoo Division of The New York Air Brake Company, first vice president; J. A. Marsh, vice president of Rivett Lathe & Grinder, Inc., second vice president; and Ellwood G. Peterson, president of Hannifin Corporation, treasurer.

The association's fall meeting is scheduled for Oct. 30-31, Nov. 1 at the Hotel Cleveland, Cleveland, Ohio.

to economize
STANDARDIZE *with* RING



precision PUNCHES and DIES

Ring Standardized Punches and Dies offer cost saving dependable performance for all of your perforating problems.

Precision volume production to rigid specifications offers

★ Low cost
★ Complete interchangeability
★ Immediate shipments from stock on Standards plus prompt delivery on Specials
★ High quality — long life

MANY SHAPES AND TYPES

ROUND SQUARE OBLONG HEXAGON RECTANGULAR

Blanks — Pilots — Headless — Shoulder and Bevel Head Quills — Slug Ejector Punches — Transfer Punches

NEW! Tough — Accurate Retainers for Ring Punches and Dies mount easily to your die set. Available in Key Type for irregular shapes.

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Gentlemen: Please send me a copy of your new, complete CATALOG #105 at once.

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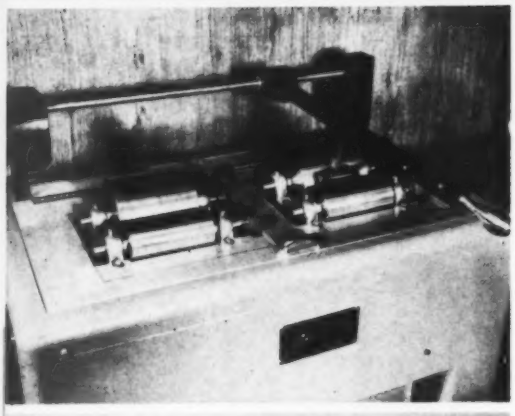
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 147

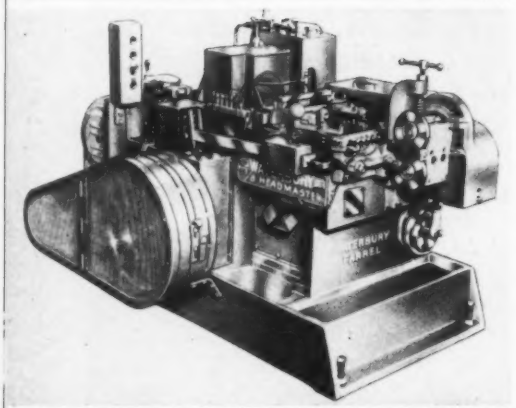
PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS

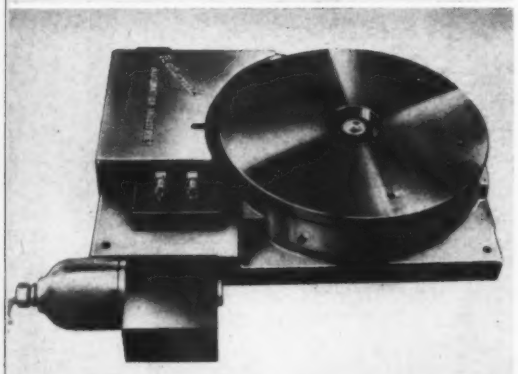


LAPPING MACHINE . . .
A hold-down device which applies pressure to the piece part being lapped or sized is a feature of this centerless lapping machine. Oversize bearings and gages, bearing races, bushings, shafts and cylinders can be lapped to 0.000010". Size Control Co., 2500 W. Washington, Chicago, or —**Circle No. A1.**

SEQUENCE VALVES . . .
Sequencing type air circuits are controlled by these valves. TD and WV valves provide for a pre-set pattern of operations to be automatically carried out by a machine after the cycle is initiated. Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, or— **Circle No. A2.**



HEADING MACHINE. . .
Head up to 450 screws or rivets/min with the Headmaster double stroke cold heading machine developed by The Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. It will head rivets up to ⅛ x ¾, machine screws up to No. 6 x ¾ and sheet metal screws up to No. 8 x ¾. This machine can be equipped with standard or Phillips type tooling. **Circle No. A3.**

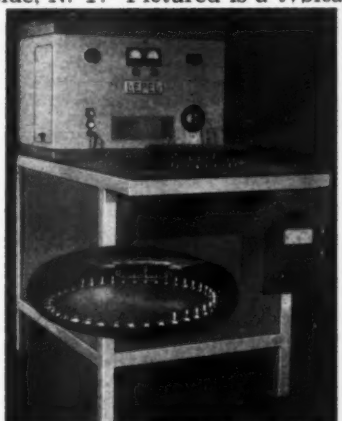


INDEX FIXTURE . . .
Grinding, milling, broaching, boring, drilling, honing, etc. operations are performed to toolroom accuracies by this hydraulic electrical index fixture. It fits in smaller areas than most index tables. The top is flat and parallel within 0.0001". Automation Mfg. Corp., 8070 Wheeler Ave., Detroit 10, or — **Circle No. A4.**

NOTCHER . . .
A 90° notch up to 4¼" deep can be cut in 16-gauge mild steel with Whitney-Jensen No. 100 hand metal notcher produced by Whitney Metal Tool Co., Rockford, Ill. The blade which is 6" long on each side, is operated by

a hand lever and eccentric-pivoted link. This tool will do various cut-out or cut-off operations on corners as well as producing 90° notches of any depth up to capacity. The lower die is quickly and easily adjusted when necessary.
Circle Inform-A-Gram No. A5.

ROTARY TABLE . . .
A new line of rotary tables, index tables and conveyor belt units for automatic continuous feed in metal joining and heat treating operations has been developed by Lepel High Frequency Laboratories, Inc., Woodside, N. Y. Pictured is a typical



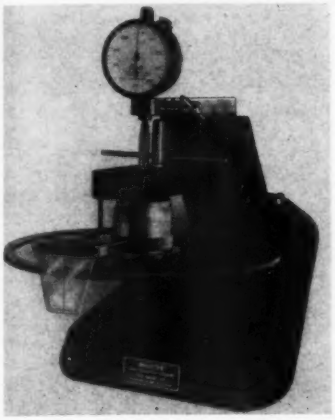
application combining Lepel high frequency induction heating with a new rotary table in the assembly of fuse plugs. An electronic tube generator is shown mounted on the rotary table. **Circle No. A6.**

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

DIAL INDICATOR CHECKER . . .

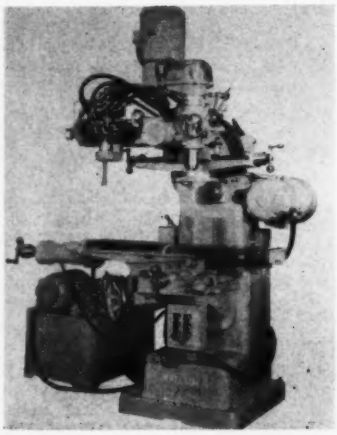
Replace the gage block method of checking the accuracy of all A.G.D. indicators with the "Master" dial indicator checker.



Readings to 0.00002" can be easily estimated. The "Master" checks indicators in all ranges up to 1.000". Petz-Emery, Inc., Pleasant Valley, N. Y., or — **Circle Inform-A-Gram No. A7.**

3-DIMENSIONAL MILL . . .

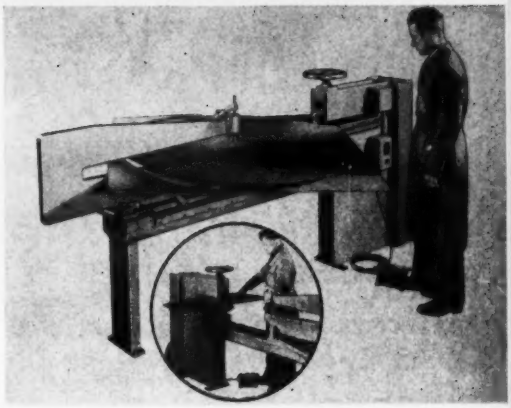
Mill, jig-bore and duplicate in three dimensions with a new 3-dimensional mill produced by Axelson Mfg. Co., Div'n of U. S. Industries, Inc., P. O. Box 58335, Los Angeles 58. Model 10RH has a hydraulic duplicator attachment for making duplicate molds



and dies or for contour milling to templates. The reversible ram turret has an all-angle spindle head at one end and slotting head at the other. **Circle No. A8.**

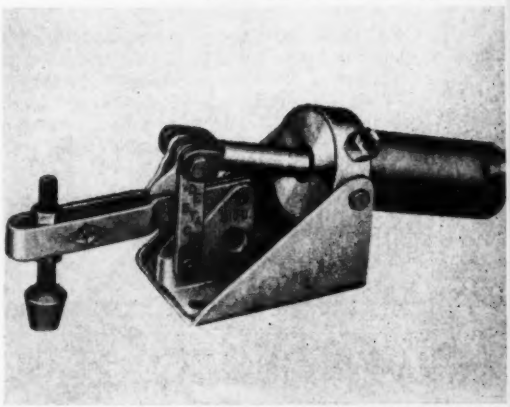
RING AND CIRCLE SHEAR . . .

Produce commercially perfect circles with Model 31-RC which has a floating circle arm for greater cutting accuracy, and will cut straight line work, irregular outlines, circles, circular holes and rings. For details, see Bulletin 70 Supplement supplied by Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, or — **Circle No. A9.**



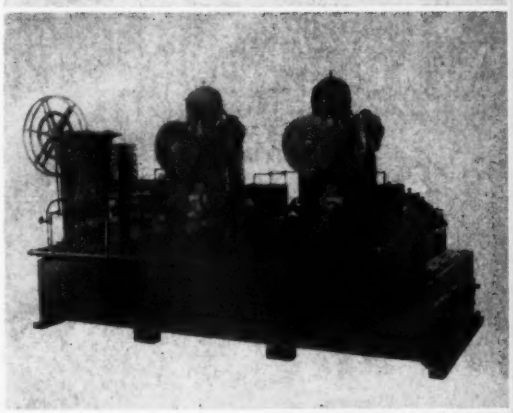
TOGGLE CLAMP . . .

Positive, split-second clamping in multiple or single unit use is provided by the "Clamp-omatic" air-operated Model 810 toggle clamp. Model 810-U has a U-bar and 810-S, a solid bar and bolt retainer. Several types of adjustment spindles are available. Detroit Stamping Co., 350 Midland Ave., Detroit 3, or — **Circle No. A10.**



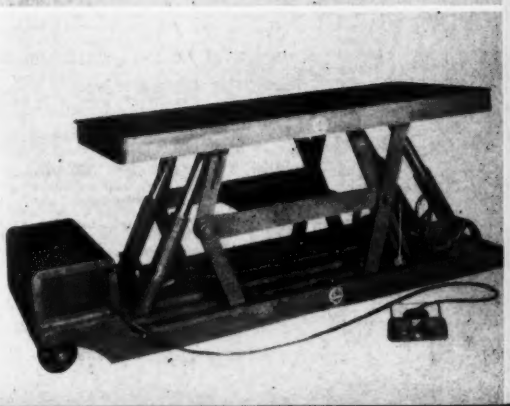
WIRE FLATTENING MILL . . .

This 3 stand tandem wire flattening mill, Model 082-062-062 has a common base and central coolant and lubrication systems. The first mill stand has 8" dia rolls and the second and third, 6" rolls. The mill features a scrap cutter for continuous processing of wire in 300-lb coils. The Fenn Mfg. Co., Newington, Conn., or — **Circle No. A11.**



LIFT TABLE . . .

The lifting speed of this 10,000-lb capacity press feed lift table is 1½ ft/min. It will handle steel sheets at shears and presses. The table which is 78" long and 36" wide, has a built-in relief valve for protection in case of overload. The Colson Corp., Elyria, O., or — **Circle No. A12.**



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lower your production costs!

Cut your assembly costs . . . speed production . . . eliminate slow, costly hand feeding. Feedmatic rotary hoppers automatically deliver small parts in proper position for assembly over attached feed tracks.

Use Feedmatic hoppers for high speed delivery of parts to machine tools, grinders, special production machines—or for sorting, counting and inspection operations.

Wherever high volume production is required, it will pay you to investigate the many cost-saving advantages of Feedmatic Rotary Hoppers. Write today, and send samples of your small parts.

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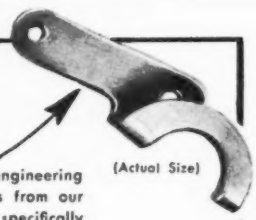

(Actual Size)

After consultation with our engineering staff and with the use of dies from our tremendous library maintained specifically to save our customers time and money, this part illustrated actually saved one manufacturer 90% of usual production costs!

Price breakdown was as follows:

Tools	$79.00
Labor	.059
Tapping	.016
Material	.0081

LOW die cost
FAST delivery

- Blanking
- Forming
- Piercing
- Drawing
- Extruding
- Stenciling
- Tapping
- Countersinking
- Plating
- Machining
- Painting
- Grinding
- Welding

Yes, WLS SPEEDTOOLING for small quantity stamping needs is a saver every time! A radical production advancement, it eliminates most of the cost required for permanent dies. Finished parts are produced to tolerances as close as those from tools costing ten times as much. When jobs are completed WLS SPEEDTOOLING is stored for future use.

Use WLS for production quantities up to 100,000 when low cost, fast delivery, possible design changes for virtually nothing, are important factors!

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3. Send in your blueprints to our engineering department for a prompt quotation.

WLS STAMPING COMPANY

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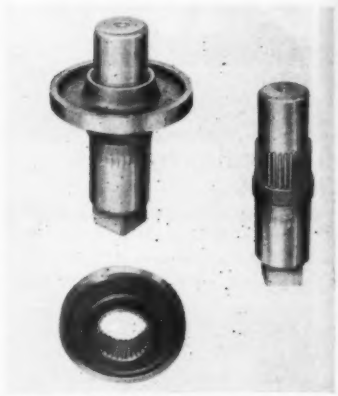
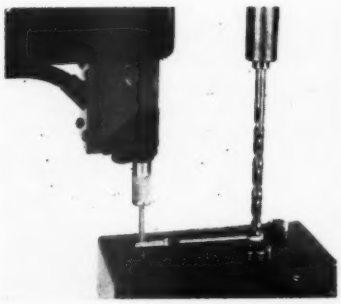
CIRCLE INFORM-A-GRAM KEY NO. 1502

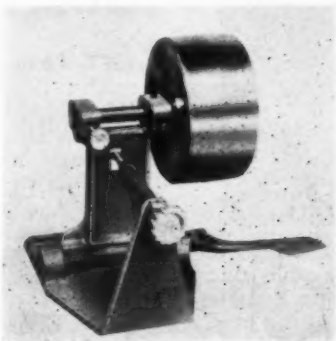
Precision Machining of Gears with involute splined bores is facilitated by these new Pin-Type Arbors developed by Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8. They speed production by a unique method of loading, locking and unloading piece parts. The Pin-Type Arbors are special tools made to order for turning and grinding operations. **Circle Inform-A-Gram No. A13.**



Measure the Lead of Threads in larger diameters and longer lengths with a bench model lead comparator introduced by Jerpbak-Bayless Co., Solon, O. It is accurate to within 0.0001". The comparator will also check the spacing of holes, grooves, notches, etc. **Circle No. A14.**

This Broken Drill Detector was developed by Progressive Automation Controls, Inc., 11601 E. Jefferson Ave., Detroit 14. It prevents damage to machines, parts and tools. Two models are available — telescoping type Model 100 mounted directly on the drill head and stationary Model 200 (shown). Details are in Catalog 156. **Circle Inform-A-Gram No. A15.**





Speeds of up to 10,000 Sfpm are provided by a new backstand idler. Model BS, available for 4", 6" or 8" wide belts, will serve as the belt idler for any grinding or polishing lathe. It features a foot pedal for belt tension release. Get Bulletin A1381 from Curtis Machine Corp., Jamestown. N. Y., or—**Circle No. A16.**

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PROBLEMS

USE THE PERFECT COMBINATION
For Assured Accuracy

LEVIN® COLLETS

Super precision collets for jewelers type lathes. Ideal for holding micro-drills or other parts where concentricity is important. Available from stock in complete range of sizes from .004" (.1 mm) to 5/16" (8.0 mm).

SPHINX MICRO-DRILLS

High speed steel micro-drills with straight or spiral flutes. Sizes from .04 mm (.0016") to 3.0 mm (.1181"). Left hand micro-drills for use on Swiss type automatic screw machines. Short flute center drills. Send for Bulletin "Q" listing complete line of drills or Catalog M listing collets as well as full line of instrument lathes and accessories.

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CIRCLE INFORM-A-GRAM KEY NO. 1511

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For peak efficiency and longer life, level your machines with EMPCO Jacks! Easily installed and re-located, EMPCO Jacks provide quick, easy machine set-ups *plus* smooth, positive adjustment! Used with VI-SORB mounting pads, Empco jacks control vibration, reduce noise, prevent creepage and cut machine maintenance costs! In many cases they eliminate the need of anchor bolts in installations.

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HAND KNOBS
6 SIZES
CAST IRON

Tapped, Reamed or Blank.
Hex-shaped hub for extra tightening.

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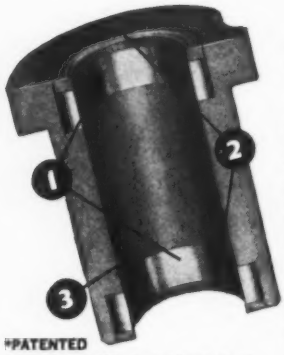
INCREASE PRODUCTION.. SAVE TIME & MONEY



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Carbide Inserted Bushings Are Doing It Daily!

How? Like this: (1) Last longer . . . with a life—in most cases—as long as solid carbide bushings at prices that approach the price of steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man-hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!

*PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

For information and prices write for MEYCO Bushing Catalog No. 41

ESTABLISHED 1888

W. F. MEYERS CO., INC., BEDFORD, INDIANA

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Expanding Mandrels

Accuracy 001" - No Distortion

No Slipping - Everlasting

K.O. LEE CO.

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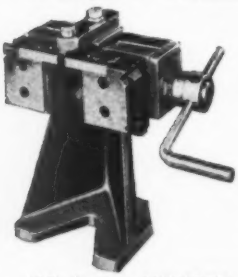
If it's made by **Lee** *it's a* **"Knock-Out"**

CIRCLE INFORM-A-GRAM KEY NO. 1522

SPEED UP DRILLING & TAPPING JOBS!



JOHN'S DRILL JIG

For cross or end drilling round, hexagon, or square stock or standard or odd-shaped rough castings from 1/8" to 8" O.D., the self-centering "John's Drill Jig" will cut tooling and production costs to minimum for 10 to 100,000 pieces.

Standard removable slip fit bushings and holders available to drill center or mean off-center. The self-centering action will hold within .0015" or better regardless of jig wear or piece part O.D. variation. Jigs available in three sizes 6", 8", 14"; jaw openings 2", 3¼", 7½".

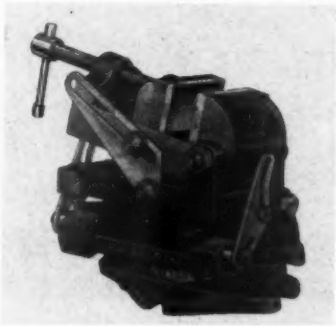
Write for complete information.

HEUSER MANUFACTURING CO.

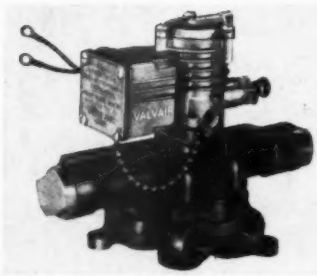
1642 N. Paulina St., Chicago 22, Illinois.

CIRCLE INFORM-A-GRAM KEY NO. 1523

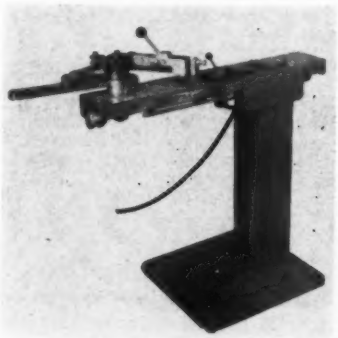
Replace Solid Forged Gooseneck Plunge Cutting Tools with gooseneck and spring tools with interchangeable high speed steel metal cutting inserts. These tools which are used on planers, shapers and lathes, can plunge cut deep slots ¼" wider than the tool's thickness without chattering. They are used for flat finishing large surface areas using from ½" to ¾" feeds, and roughing and finishing deep channels and recessed areas. B. J. Traycoff & Co., 509 Carthage Ave., Kent, O., or — **Circle No. A17.**



Quick, Easy Set-up for any machining operation requiring a simple or compound angle is provided by Palmgren No. 55 all angle vise. This vise eliminates the need for special jigs and fixtures. Chicago Tool and Engineering Co., 8383 S. Chicago Ave., Chicago 17, or — **Circle No. A18.**



Speed King Control Valves provide a service life in excess of 25 million cycles under normal operating conditions. These valves built to JIC standards, control over 600 cycles/min. They are available in single and double solenoid types for foot, sub-base or manifold mounting in ¼", ⅜", ½" and 1" pipe sizes. For complete information, get Bulletin SK-356 from Valvair Corp., 454 Morgan Ave., Akron, 11, or — **Circle Inform-A-Gram No. A19.**

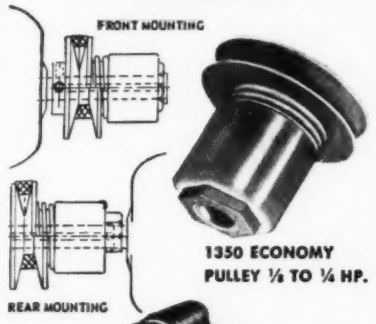


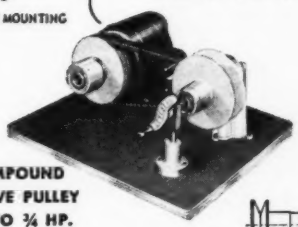
A Line of Metal Forming Machines has been introduced by Kilham Engineering Inc., R. D. 1, N. Attleboro, Mass. They will bend steel tubing and solid stock. These machines are air-powered benders with revolving heads. Shown is Curvit 103. **Circle No. A20.**

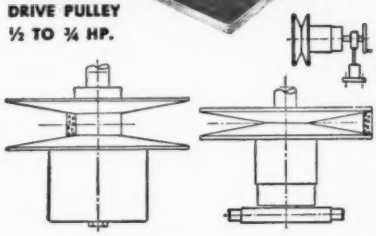
Lovejoy

Fractional Horsepower

VARIABLE SPEED PULLEYS







Economical—
low in initial cost . . . easily installed on old or new equipment.

Minimum Maintenance—
simple construction assures trouble-free operation . . . lifetime lubricated with oil-impregnated bronze bushings.

Constant Belt Alignment—
inner and outer pulley sheaves open equally to provide smooth, infinitely variable speed ratios to 8 to 1.

No Slippage—
Sure grip of belt sides delivers full traction under all load conditions...result is greater horsepower carry capacity.

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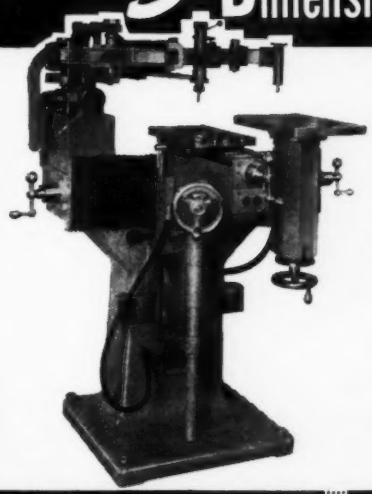
CIRCLE INFORM-A-GRAM KEY NO. 1531

3-Dimensional panto-miller



For accurate pantograph milling on all 3-dimensional work, the "Panto-Miller" 3A is a sturdy production machine. Accurately reproduces copy on flat or curved surfaces, in reduced or magnified size.

NEW:

Capacity for workpiece height.
Sensitivity of linkage.
Range of pantograph ratios.
Accuracy of reproduction.
Finger-Tip Control of spindle speeds.
Ease of operation.

The new Panto-Miller 3A is an economical answer to many standard and special production problems. Write for Bulletin PM3, which gives details and specifications.

2-Dimensional panto-miller

Versatile and dependable for continuous service, the J & B "Panto-Miller" 2A:

Engraves
Profiles
Die Cuts
Mills

Investigate its advantages for your own applications. Send for Bulletin PM2

3-WAY Indexing Trunnion

Simple, Rapid, Positive positioning of workpiece or jig for all angle Drilling, Tapping, or Counterboring. Available with Chuck, Faceplate, or Right-Angle Adaptor Plate. Complete with Station Selector. For details, ask for Bulletin IT3.

J&B EST. 1870

JOHNSON & BASSETT, INC.

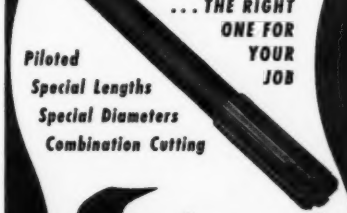
PRODUCTION TOOL DIVISION
WORCESTER, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 1532

ALL TYPES OF REAMERS

. . . THE RIGHT ONE FOR YOUR JOB

Piloted
Special Lengths
Special Diameters
Combination Cutting



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CARBIDE REAMERS
STRAIGHT OR TAPER SHANK

Send drawings for Prompt Quotations

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Carbide Reamers • Form Tools
MUSCATINE 4, IOWA

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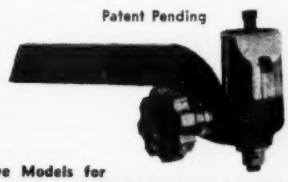
Monarch Precision

SHAPLANE

Radius Tools

Patent Pending



Five Models for
LATHES, SHAPERS, PLANERS AND BORING MILLS.

RANGE ½" TO 3" RADIUS (MODELS ALSO AVAILABLE FOR CONVEX CUTTING, AND CONCAVE RADII TO 6" ON PLANERS, ETC.)

C. B. TEETER
Tool Room Specialties
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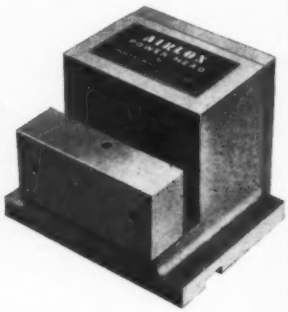
Phone Drexel 3-3571

CIRCLE INFORM-A-GRAM KEY NO. 1534

If 1000 lbs. Push Is Enough . .
POWER HEAD Is the Answer!

New
AIRLOX
TM REG. U. S. PAT. OFF.
POWER HEAD
No. 400



- POWER FOR FIXTURES
- MAKE YOUR OWN AIR VISES
- WELDING POSITIONING
- USE SINGLY OR IN MULTIPLES

Specifications:
Height: 4-13/16"
Width: 6-1/2"
Length: 5-3/8"
Weight: 24 lbs.
Ratio of Push to Air Pressure: 12-1/2
Stroke: 1" Spring Return

Power Head Foot or Hand Valve 5 foot Air Hose **$67.50** F.O.B. WHITEHALL, NEW YORK

production devices incorporated
WHITEHALL, WASHINGTON COUNTY, N. Y. PHONE 40

CIRCLE INFORM-A-GRAM KEY NO. 1541

PRESSED STEEL STAMPING
vs.
BRONZE CASTING

SMALL LOT TECHNIQUE
USING TEMPORARY TOOLS
SAVES $142.40

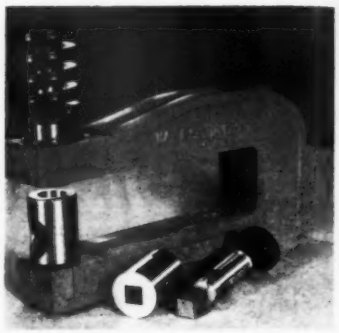
Conversion from casting to stamping saved a Skokie, Illinois manufacturer of production line chains $142.40 on an initial order of replacement links that also proved lighter and stronger.

Dayton Rogers' short-run metal stamping facilities will handle blanks 22" square, material up to 3/8" thick, and drawing up to 4 1/4" deep.

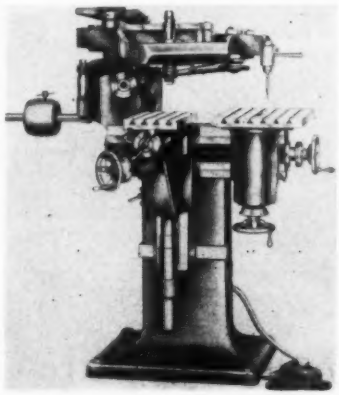
SEND YOUR SKETCH, BLUEPRINT OR PART, PLUS QUANTITY, FOR PROMPT QUOTATION

DAYTON ROGERS
Manufacturing Company

MINNEAPOLIS 7B, MINNESOTA
CIRCLE INFORM-A-GRAM KEY NO. 1542

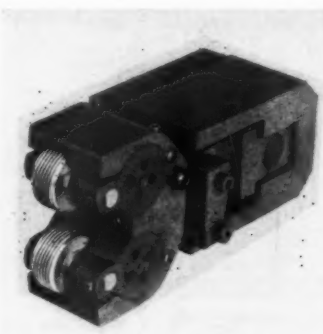


This CJ Punching Unit has been announced by Wales-Strippit Corp., 345 Payne Ave., N. Tonawanda, N. Y. Round and shaped punches can be used interchangeably in this unit which has a capacity of 1¼" dia holes in ¼" thick mild steel or equivalent metal. Two keyways in the punch and die allow 90° positioning of each shape. Other angles of keying are also available. **Circle No. A21.**



A 3-Dimensional Pantograph Engraver has been introduced by Aaron Machinery Co., Inc., 45 Crosby St., New York 12. Pear Model PF/2 is used for mold making and also for 2-dimensional engraving and routing. The machine's construction insures maximum accuracy, easy movement and exact production. **Circle No. A22.**

A Non-Magnetic Case is one feature of the redesigned Basco sheet steel separator. This permanent magnet unit is used for continuous sheet steel separation. It eliminates marring of sheet edges and reduces handling costs. The separator is made in 23 models and 4 sizes for handling sheet steel from tin can stock up to ¼" plate, in stacks up to 32" high. E. V. Nielsen, Inc., 129 Broad St., Stamford, Conn., or — **Circle Inform-A-Gram No. A23.**



Produce Precision Threads on automatic screw machines with Series B thread rolling attachment. This easy-to-set-up tool can roll Class 2A and 3A threads. It is built in 4 standard sizes. Reed Rolled Thread Die Co., Worcester, Mass., will supply Bulletin B-1 with details, or — **Circle No. A24.**

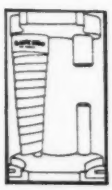
ARROW TOOL & REAMER CO. • Established 1916

Manufacturing skill and tool making experience for over 37 years — adds up to preference for Arrow End Mills.

ARROW TOOL & REAMER CO.
418-422 Livernois Ave. • Detroit 9, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1551

ON Dies EQUIPPED WITH
ELASTICONE GUIDE PIN COVERS



Day after day, year after year, manufacturers of ALL products are discovering how Elasticone Guide Pin Covers can work for them . . cutting die costs by eliminating the need for spare dies. Inexpensive Elasticones close the gap between pins and bushings, protecting dies against breakage . . protecting workers against injuries. Available in sizes to fit most pins and bushings.

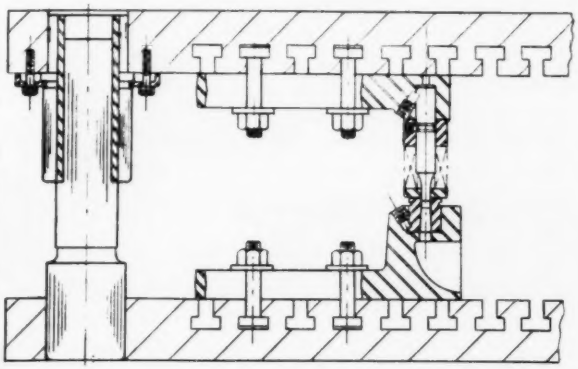
Write for complete literature and new Technical Bulletin 53

CENTRAL *Safety Equipment Co.*
6603 Marsden St. PHILADELPHIA 35, PA.

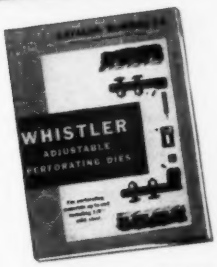
CIRCLE INFORM-A-GRAM KEY NO. 1552

ADJUSTABLE DIES *by* WHISTLER

• Operate like a single purpose die • Easy to set-up and make changes • Interchangeable and re-usable parts always ready for a new job • Reduce die costs to a new low • Pierce holes in any desired arrangement of shapes and sizes • Precision piercing of materials to ¼" thick steel.



Above: Sectional drawing of a Whistler adjustable punch and die unit assembled in T-slot die set. **Below:** A completely assembled Whistler adjustable die ready for the press.



YOU NEED THIS CATALOG

to see for yourself in dollars and cents what this adjustable die making method can do for your plant. Send for it right now...without obligation.

S. B. WHISTLER & SONS, INC.
748 Military Road, Buffalo 23, N.Y.

ADJUSTABLE, MAGNETIC and CUSTOM DIES FOR ALL INDUSTRY
Direct Factory Representatives Located in Principal Industrial Areas

"Visit us at Booth 2014 — National Metal Exposition, Cleveland — Oct. 8 to 12"
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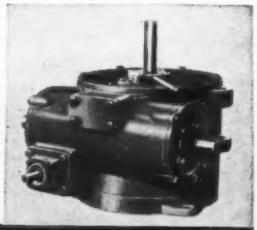
PRODUCE OR ASSEMBLE COMPLICATED PARTS OR COMPONENTS AUTOMATICALLY

WITH

STANDARD TOOL AUTOMATIC CAM-OPERATED INDEXING UNITS

Provide accurate positioning for mechanical operations such as

SOLDERING, CRIMPING, MILLING, DRILLING, PUNCHING, ASSEMBLY



Fully described and illustrated in Bulletin 12

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STANDARD TOOL & MANUFACTURING CO.
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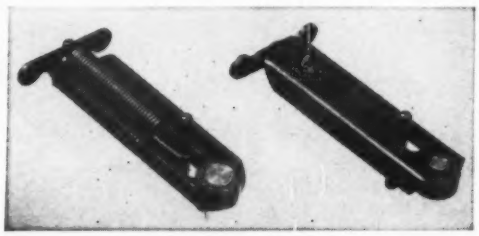
CIRCLE INFORM-A-GRAM KEY NO. 1561

FOR POSITIVE STOCK ALIGNMENT
IN PROGRESSIVE DIES



Amcor Roller Stock Pushers

SPEED UP PRODUCTION with precision-made AMCOR Roller Stock Pushers. Easy, smooth stock feeding, without buckling, assures more production with less operator fatigue.

SAVE MONEY. AMCOR Roller Stock Pushers sell for just a fraction of what hand-made bench models cost to make.

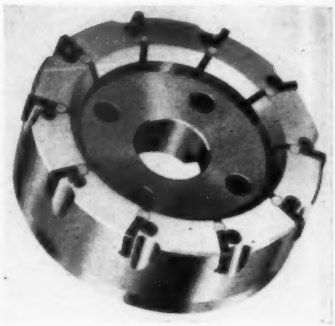
SIMPLE TO INSTALL. Requires only a slot milled in the stripper plate, and a hole drilled in the die block and stripper plate. Tracing template for slot and hole location is supplied. When die is sharpened, no refitting is necessary.

The AMCOR Roller Stock Pusher is quickly adaptable to any work specifications. Distributors throughout the country stock a complete line of nine models to fit all production needs.

Write us for complete information

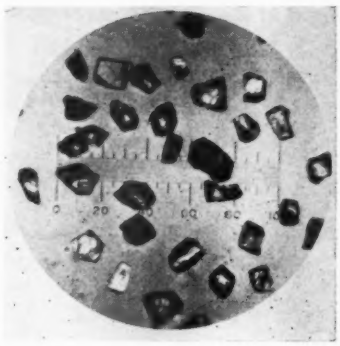
APPLIED MECHANICS CORPORATION
460 LYON, N. E. GRAND RAPIDS MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1562

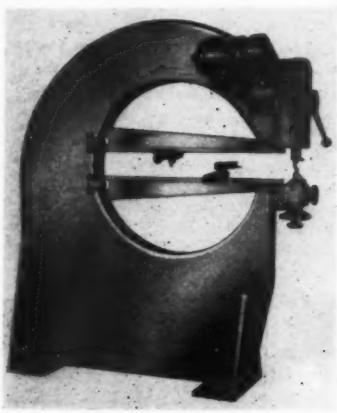


This Milling Cutter uses "throaway" carbide blades which can be indexed eight times and then discarded with no cutter grinding or blade regrinding. The Futurmill cutter will mill all materials at either high feed and speed applications or in heavy duty, interrupted milling. Detroit Milling Cutter Co., 28625 Grand River, Farmington, Mich., or — **Circle Inform-A-Gram No. A25.**

Uniformly Flat Grinding is assured with a new carbide tool grinder with an oscillating spindle. The tool is held in a stationary position and the oscillating wheel does the work. Model OCE-6 is adapted for either conventional or electrolytic grinding. Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich., or — **Circle No. A26.**

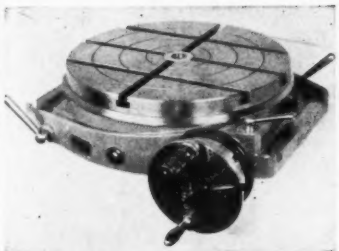


Mirror - Bright Finishes and fast cutting speeds are assured with a lapping compound using tiny diamond particles of uniform size. The compound is used for final finishing molds, punches, tools, dies, rolls, etc. Di-Met Corp., 1873 Mullin St., Torrance, Calif., or—**Circle No. A27.**



Flanging; Planishing; nibbling; straight, circle and figure cutting; etc. are performed by a universal sheet steel and plate working machine. G-V Metal Worker Trimmer Model 340A has a 34½" deep throat and will make 3400 cuts/min with a cutting speed of 10 ft to 23 ft/min. Tech-Pacific, 2811 Lafayette, Newport Beach, Calif., or — **Circle No. A28.**

WALTER



PRECISION DIVIDING ROTARY TABLES

With and Without Dividing Discs

- READABILITY: 6 SECONDS.
- CONSTRUCTED FOR LONG LIFE.
- MAINTAIN PRECISION.
- AVAILABLE IN 10", 12½", 15¾", 19¾", 25", 31".

Also many types of Universal Precision Dividing Heads and Attachments for most economical production.

Test reports furnished with literature.

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404 FOURTH AVE., DEPT. TP
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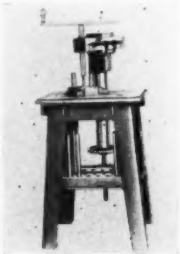
NEISE MODERN TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 1571

NO BREAKAGE

PRODUCTO
UNIVERSAL
HAND TAPPER

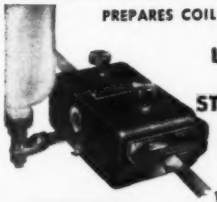


For accurate hole-tapping without tap breakage, this Hand Tapping Machine is a "must" for every tool and die shop and toolroom. You can tap holes at any point in work within area of machine table. Quick-change spindles hold taps. Ready for instant use. Write for Bulletin TE4-102.

The Producto Machine Co.
970 Housatonic Avenue
Bridgeport 1, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 1572

PREPARES COIL STOCK FOR PRESS



New Low Cost
LIGHT-DUTY OILER-STRAIGHTENER
$95.00
Handles stock up to 3" wide, 1/16" (app.) thick
Write for details

JACO DEVICES, INC.
96 High St., Hingham, Mass.

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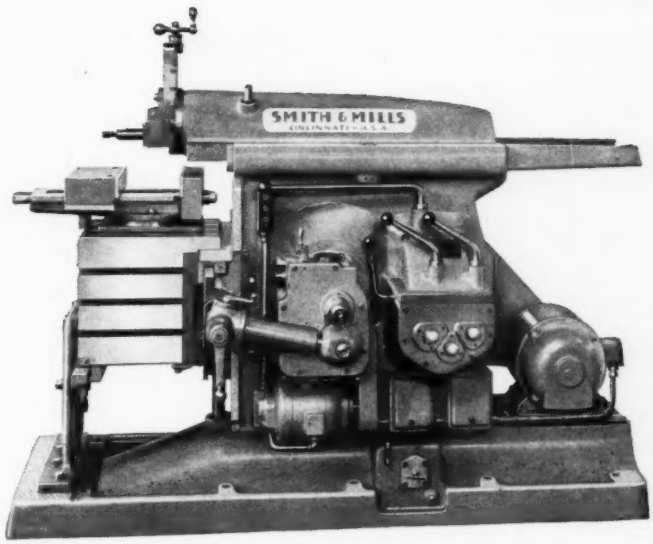

Bull ram gear, rocker arm and universal table trunnion made of ductile iron for extra rigidity.

SMITH & MILLS SHAPERS— for production and tool room

Compare Smith & Mills with any other shaper for versatility, speed, cutting power and precision performance. *Compare* and you'll *buy* Smith & Mills—famous for high quality shapers since 1888. Write or wire for prices, deliveries, repair parts or field service. Smith & Mills Shaper Division, Nebel Machine Tool Corp., 3401 Central Parkway, Cincinnati 25, Ohio.

Smith & Mills Shapers now available in Heavy Duty Models in 16", 20", 25", 28", 32" and 36" strokes, and Standard Duty Models in 20" and 24" strokes.

Smith AND Mills
SHAPERS CINCINNATI

CIRCLE INFORM-A-GRAM KEY NO. 1574

LUCAS TOTE PANS

HELP SOLVE PRODUCTION PROBLEMS!

Lucas Tote Pans are built for long wear and ease of handling. Designed for every shop use—storing materials, holding parts for convenient handling by machine operators and at assembly lines, Lucas Tote Pans are available in nesting type, stacking type, straight side and assembly or bench pans. Lengths from 10" to 32", widths from 5" to 23" in standard sizes. Other sizes made to your specifications.

For Further Information, Write

J. L. LUCAS & SON, INC. Bridgeport 5P, Conn. Tel. CLearwater 9-3393

CIRCLE INFORM-A-GRAM KEY NO. 1575

For DRILLING, CORE DRILLING, ROUGH and FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work — or both.

Eliminates expensive tool construction — Reduces tool wear — Prevents seizure and pilot breakage — Especially adapted where precision is required.

Write for full information and prices

GATCO ROTARY BUSHING CO.
42322 ANN ARBOR RD., U. S. 12, PLYMOUTH, MICH.
Telephone PLYMOUTH 1472

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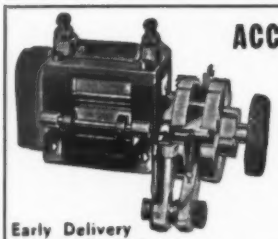

ACCURACY with SIMPLICITY and LOW COST with "RFC" ROLL FEEDS

Models to fit:
ANY PRESS
FOR ANY JOB
FOR STOCK UP TO
12" WIDE

Early Delivery on Standard Models

"RFC" ROLL FEEDS are quality built for long, dependable service.

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ROLL-FEEDS CORPORATION
Pawtucket, Rhode Island
An Electrix Affiliate

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METAL PRODUCTION CAPACITY AVAILABLE

For long or short production runs of large or small parts, tools, jigs or fixtures. Also dies, gages, special machinery.

KELLER PROFILOMETER-DUPLICATOR, 16" x 24"
PRESSES UP TO 450-TON, 48" x 48", TRIPLE ACTION
PLANERS UP TO 20-FOOT STROKE, 72" x 72"
RADIAL DRILL PRESSES UP TO 8-FOOT, 19" COLUMN
LATHES UP TO 158" c.c., 57½" gap, 40" SWING
BORING MILLS UP TO 120" BED, 90" HORIZ., 60" VERT.

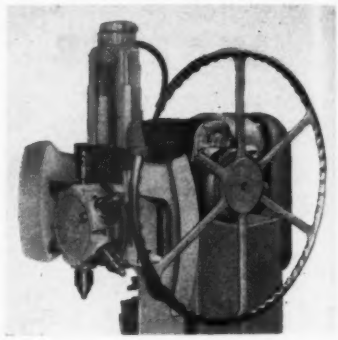
Also Milling Machines, Grinders, etc. Complete production facilities — experienced machinists.

Inquiries Invited on Contract Basis or Individual Quotation

PIVOT PUNCH & DIE CORPORATION
NORTH TONAWANDA, N. Y. Phone JA. 1200

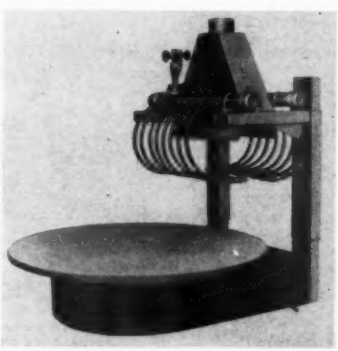
CIRCLE INFORM-A-GRAM KEY NO. 1583

Drill Large Holes with ease and improve quality of work using this power feed on hand operated Burgmaster turret drill Models 2A, 2B and 2BR. The infinitely variable power feed has a range of ½ in to 6 in/min. Burg Tool Mfg. Co., Inc., 15001 S. Figueroa St., Gardena, Calif.; or—**Circle No. A29.**



Faster, Easier Tool Changes and precision adjustment for depth of hole are features of a new, improved line of drill stops. The drill stops can be used wherever uniform hole depth is required. They are available in 8 sizes to accommodate drills up to 1½" dia. Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, or — **Circle No. A30.**

Faster Stock Removal and greater accuracy are possible with the Centalign automatic internal grinder. It was designed for long-run, high-production grinding of bearing raceways and taper bores and for similar operations on various work parts. The Centalign has a 10" swing and a 1" grinding stroke. Bryant Chucking Grinder Co., Springfield, Vt., or —**Circle No. A31.**



Braze, Solder, Anneal and Harden small parts with this turntable heating unit for full or semi-automatic operation. Workpieces to be heated are held by simple fixtures to the turntable. Gas Appliance Service Inc., 1211 Webster Ave., Chicago 14, or — **Circle No. A32.**

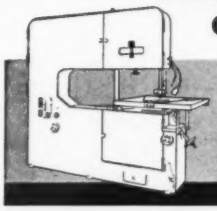
FRICTION SAWING with Tannewitz HIGH SPEED BAND SAWS

FASTEST, BEST MEANS OF CUTTING METALS

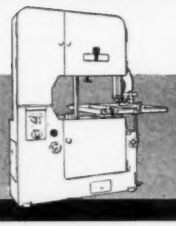
If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

THE TANNEWITZ WORKS

GRAND RAPIDS, MICHIGAN ☎ GL-6-1729



TANNEWITZ DI-SAWS — 24", 36", 48", 60" CAPACITIES
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free DI-Saws on the market. Write for bulletin.



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✓✓✓ Check these 3 Comet 'TIPS' for Precision Boring, Facing and Internal Threading

MADE OF HIGH SPEED or CARBIDE
FOR HOLES FROM 1/16" UPWARD
17 DIFFERENT SIZES

✓ BORING TOOL

- FAST PERFORMANCE
- ECONOMY IN PRODUCTION
- EFFICIENT IN RESULTS

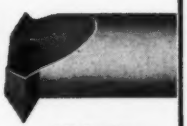
Cutting Edges are lapped for better "Bores" and faster Feeds.

✓ FACING TOOL

- CONSTANT CLEARANCE
- CONSTANT SHAPE OF CROSS SECTION
- EASY RESHARPENING
- CONVENIENT TO USE
- LONG LIFE

✓ INTERNAL THREADING TOOL

- CONSTANT SHAPE AND CLEARANCE
- EASY RESHARPENING
- CONVENIENT TO USE - LONG LIFE



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CIRCLE INFORM-A-GRAM KEY NO. 1592

The Quick, Easy, Handy Way to TAP BY HAND

. . . Adapts for LATHE USE

THE DAHLSTROM TAP GUIDE virtually eliminates tap breakage—and saves those costly hours spent prying broken taps out of dies. Anyone can use it. Just a few turns of the spindle and the job is done.

Winds through continuously, with no backoff. Work is always dependably straight and square. Fasten it to a post or set it on top of a big job. This handy tapper comes equipped with 9 adapters, 8-32 to ¾" but taps are not furnished. Spindle can be pulled out and used in a lathe, or used as tap extension for hard-to-get-at-places. 13" x 8" x 14", wt. 32 lbs. $59.50 F.O.B. factory.

Also Makers of Dahlstrom Autostrop and Tap Chuck
Send for bulletin

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16 Olson Drive
NORTH BRANCH, MINN.

Dahlstrom TAP GUIDE

CIRCLE INFORM-A-GRAM KEY NO. 1593

HOLES JIG GROUND with *Vulcanaire*

Provide yourself with this inexpensive* instrument for use on your present equipment and JIG GRIND with a guarantee.

A five station indexing fixture from Vulcan's Contract Tool Room (Your tool room in Dayton).

Using a jig borer index table with the Vulcanaire 5 indexing holes and 35 locating and clamping holes were JIG GROUND in place. Result—eliminated all close locating and dowelling of individual parts and of course hours of time.

*Vulcanaire equipment pays for itself on the first job.

Borrow Vulcan's instructive movie on jig grinding

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YOUR TOOL ROOM in DAYTON

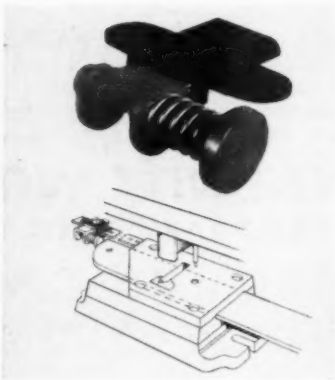
Engineering, Processing, Designing . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and Size . . . Vulcanaire Grinding Heads . . . Motorized Rotary Tables . . . Plastic Tooling . . . Vulcanaire Jig-Grinders.

VULCAN TOOL CO.

741 LORAIN AVENUE DAYTON 10, OHIO

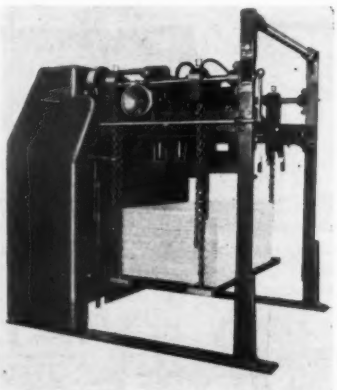
CIRCLE INFORM-A-GRAM KEY NO. 1601

Fast External Adjustment of the Cams while the press is in operation is accomplished by a rotary cam limit switch. This eliminates guess work in the timing of the switch. Two sizes are available — 4 (shown) and 12 cams. Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, or — **Circle No. A33.**



This Low Cost Parting Die Stop can be installed in minutes on any die and is adjustable two ways for any parting die operation. It is adaptable for any cut-off operation such as parting dies, cut-off saws, etc. Keystone Engineering and Mfg. Co., 122 S.W. 16th St., Des Moines, Iowa, or — **Circle No. A34.**

Roll Metal Powders into Strip with a new powdered metal rolling mill manufactured by Stanat Mfg. Co., Inc., 47-28-37th St., Long Island City 1, N. Y. Model FH-400 has 6" dia x 6" face width chrome-vanadium alloy steel cold rolls, arranged horizontally. The unit can produce strip from such powders as copper, brass, nickel, molybdenum, etc. **Circle No. A35.**



125 Sheets/Min are handled by a redesigned 6000-lb capacity sheet metal feeder. It automatically separates, lifts, calipers and advances sheets up to 44" x 48" to the feeding station of the press, coater, slitter, shear or other machine to which it is attached. Dexter Folder Co., Pearl River, N. Y., or—**Circle No. A36.**

MAXWELL

Automatic RECESSING TOOLS

REDUCE INTERNAL FORMING COSTS

These fully automatic quickly adjustable tools save time, and cut costs on precision grooving, undercutting, inaccessible spot facing, chamfering, back facing and necking.

Maxwell Type JF Automatic Recessing Tools operate on the principle of an eccentric cutter holder actuated on its own axis. This is accomplished by the unique Maxwell Helical Gear and Diagonal Toothed Rack Mechanism.

They are used with jig or fixture on automatic or manual feed machines. Long-life circular form cutters, or tool bit holders with tool bits may be used. Location and diameter of recess are individually controlled by stop collars, adjustable to within ± 0.001-inch. Five sizes available to pilot into 1" to 2¼" bushings. Furnished with standard, adjustable adapter, quick change, straight or special shanks.

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388R-MC

THE MAXWELL COMPANY

MACEDONIA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1611

You Can Rely on a **ROUSSELLE**

THESE 40-TON PRESSES take job after job in stride and give you top speed and uniform output on a variety of work. They stress simplicity in every detail to achieve quicker set-ups, easier changeovers and simpler operation. All are extra rugged, high precision units, made to withstand hard usage and assure long, satisfactory service. They are *very moderately priced.*

Manufacturers of Rousselle Presses

Significant savings may result if you let our engineering staff assist you. There is no obligation.

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Rousselle Presses are sold exclusively through leading machinery dealers.

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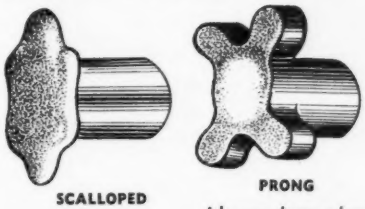
Choice of 25 models in 5 to 40-ton sizes.

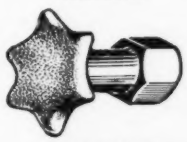
SERVICE MACHINE CO. 2310 West 78th Street • Chicago 20, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1612

REID TOOL ROOM *Accessories*

CAST IRON HAND KNOBS





Made in three types and a wide variety of sizes. Designed to improve appearance of product. Well proportioned with eye appeal. Made of fine grain cast iron. Smooth finish—no sharp edges. Can be supplied drilled and tapped or drilled and reamed when desired. Low prices.

Also

Get our low prices for plastic and steel ball handles, machine handles, compression springs, etc.

Quality at Moderate Prices!

FREE 60 Page Catalog

REID TOOL SUPPLY CO. Muskegon Heights, Mich.

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STAMPINGS - - - SHORT RUNS

A dependable service for small quantity requirements for new developments and production up to 50,000 pieces. QUICK DELIVERY — ACCURACY — backed by 25 years' experience.

SMALL LOT STAMPING CO.

Linden 3-3700 "Dedicated to Short Runs" 1025 W. Blancke St. Linden, New Jersey

CIRCLE INFORM-A-GRAM KEY NO. 1614

ALL in ONE TOOLHEAD*

BORING
FACING
TURNING
GROOVING
UNDER CUTTING

SIX SIZES AVAILABLE

ALL HAVE POWER FEED FOR FACING

Model "D"

* A BORING HEAD THAT WON'T FACE IS NOT COMPLETE

WRITE for COMPLETE DETAILS

CHANDLER TOOL CO
Muncie, Indiana

COMBINED BORING & FACING TOOL HEADS
Chandler-Duplex

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Gage Company PRECISION PLASTIC
COMPARATOR SCALES

Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

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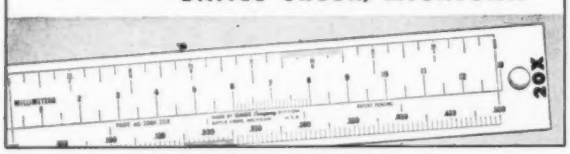
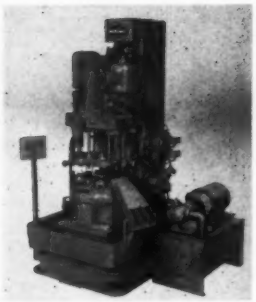
GAGE COMPANY
BATTLE CREEK, MICHIGAN



CIRCLE INFORM-A-GRAM KEY NO. 1622

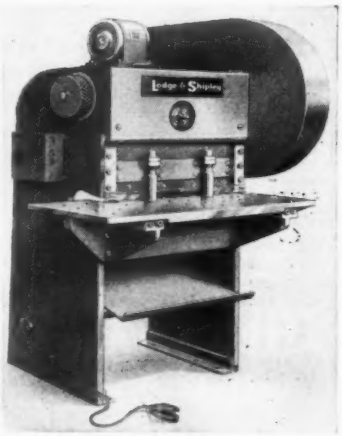


Drill, Chamfer and Tap a 5/8-18 Hole in a flange nut with the completely automatic little "Giant" which performs all these operations on 750 flange nuts/hr. This special machine which has automatic lubrication and self-contained coolant tank, is built with standard components. Michigan Drill Head Co., P. O. Box 4643, Detroit 34, or — **Circle No. A37.**

This Angle Gage can be attached to suit the direction of rotation when milling, planing, boring, grinding or marking a piece at varying angles. It can be used with every machine tool without a dividing device — shapers, milling machines, lathes, drill presses and grinders. Borel and Dunner Co., 19313 Farmington Rd., Livonia, Mich., or — **Circle No. A38.**

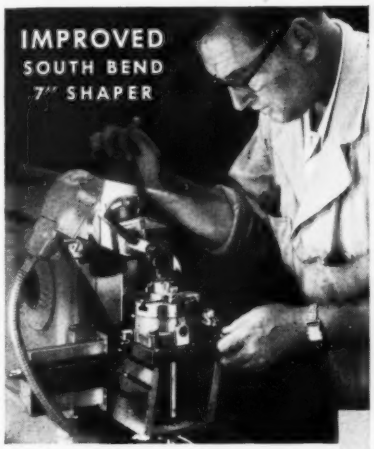
High Speed Production in slitting screw heads of all types is simplified with an improved screw slitting machine. The automatic machine will handle sizes ranging from 0.100" dia by 1/4" long to 1/4" dia by 2 3/4" long. Without special attachments, production rates are about 50 screws/min, and with them, 75/min. Four indexing plates are included as standard equipment. Haller, Inc., Plymouth, Mich., or — **Circle No. A39.**

Fast, Heavy Duty Power Shearing is performed by a new 24" production shear. It has a 24" blade length, a throat 7 1/2" deep and capacity up to 1/8" in mild steel and operates at speeds up to 120 strokes/min. The shear will do straight and angle shearing, sequence shearing, slitting, notching, blanking, etc. The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, or — **Circle No. A40.**

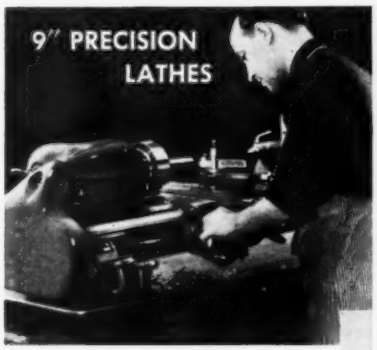


2 Top Values

for Small Work



Only 7" bench shaper with pressure lubrication of ram dovetail bearings, bull gear teeth and crank pin slide bearings—keeps wear to a minimum, helps absorb shock of intermittent cuts. This precision shaper has speed, accuracy and handling ease to produce more and better work at lower cost. Write for Catalog. Factory price $551, less motor.



These popular lathes offer maximum value for your equipment dollars. Their quality and construction will give long years of dependable, efficient service on close-tolerance machining of small parts. Factory prices from $234, less electrical equipment. Write for Catalog. 85 other models and sizes to choose from to meet your needs.

SOUTH BEND LATHE

SOUTH BEND 22, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1631

SYNTRON

Vibrating

LAPPING POLISHING MACHINES

- Automatic, high-speed lapping and polishing of parts, samples, etc.
- Produce perfect metallographic finishes in one-third the time.
- Eliminate use of expensive polishing wheels—practically no rejects.

of proven dependable Quality

New Syntron Lapping-Polishing Machines are completely automatic. Driven by variable controlled electromagnets, they assure a positive, even polishing action on practically any part or sample where microscopic finishes are required. No expensive installation or grinding equipment required.

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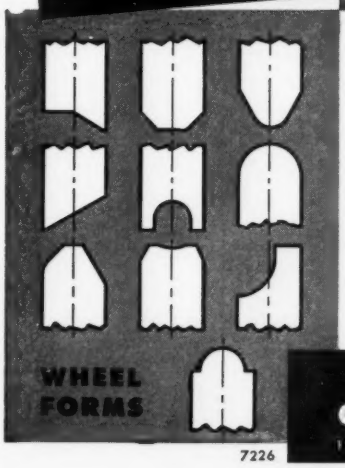
SYNTRON COMPANY

341 Lexington Ave. Homer City, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1632

Precision Dress Grinding Wheels to ANY FORM IN ¼ THE USUAL TIME



7226

The Perfex TANGI-MATIC Dresser is a self-contained precision tool built by an organization of master gagemakers for high precision work.

Any shop man who can read a "mike" can operate the dresser the first time. No Jo Blocks, no height gages or other auxiliary tools needed. All radii and angles are read directly.

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PERFEX

PERFEX GAGE & TOOL CO.

123 AVERY ST. • MT. CLEMENS, MICH.

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GEORGE L. DETTERBECK CO.

SINCE 1911

World's Largest Exclusive Manufacturer of
SCREW MACHINE TOOLS!

CUTTING CAMS • HIGH SPEED STEEL AND CARBIDE FORM TOOLS • SPECIAL CUTTING TOOLS • SPLIT DRILL BUSHINGS • CROSS SLIDE KNURL HOLDERS • TOOL BITS • BOX TOOLS • BURNISHING TOOLS • REVOLVING STOPS • RECESS SWING TOOLS • FORMING SWING TOOLS • Standard sizes 00, 0, 2, carried in stock.

We specialize in one thing only... designing and making SCREW MACHINE TOOLS!

45 years experience goes into every tool we make. They come to you ready for use... Precision design... Skilled workmanship... Finest materials.

Our extensive facilities save you TIME... MONEY... and give you accuracy, quality and quick service.

• 45 Years at the Same Address

GEORGE L. DETTERBECK CO.
1871 Clybourn Avenue • Chicago, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1641

MAYLINE

MAY-O-MATIC

A New Table By Mayline

Now, a table featuring instant height and top tilt adjustments, plus space saving accessory units. Base is heavy gauge steel. Solid Basswood metal-edge top. Also has sliding reference top.

Table is produced in popular top sizes and in two base sizes. Write factory for complete information.

Symbol of MAYLINE Superiority

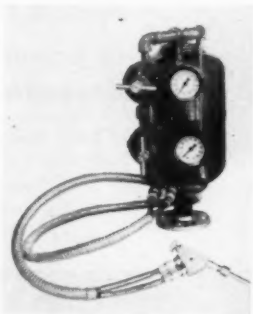
Mayline Company
635 No. Commerce St.
Sheboygan, Wisconsin

METAL PLAN FILE

MAYLINE

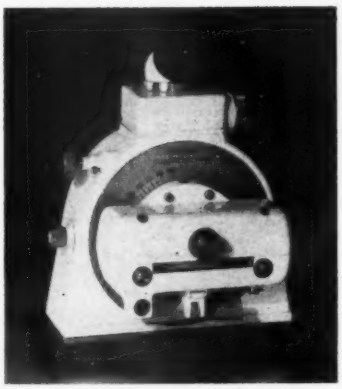
CIRCLE INFORM-A-GRAM KEY NO. 1642

A System of Programming and Scheduling Tool Changes to achieve higher operating efficiency is provided by this tool control system. The cyclometer panels provide a visual record for the used and unused life of each tool. The unit includes tool holding board, bench, cyclometers, adjustable adapters, gages and fixtures. Seibert and Sons, Inc., Chenoa, Ill., or — **Circle No. A41.**



Cut Metal Machining Time up to 75% with the Liquidaire industrial cooling and lubricating system. It is designed for toolroom and single point metal cutting and stamping operations. Complete units are available in 1, 3 and 6 gal sizes. Shown is Model P-1-DCV. For details, write H. J. Goodyer, Frisch Corp., 1400 W. Wabansia, Chicago 22, or **Circle No. A42.**

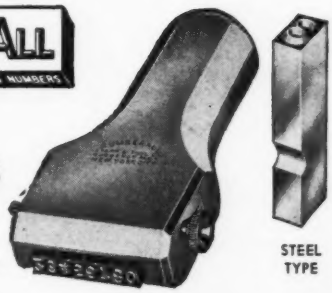
This Precision Clinometer reads directly to one second of arc. Type TB95 Microptic clinometer is used wherever inclinations have to be read to great accuracy. The leveling unit can be removed and replaced by a table, workholding fixture or mirror attachment for testing circular spacing on gears, etc. Engis Equipment Co., 431 S. Dearborn St., Chicago 5, or — **Circle No. A43.**



Fast, Efficient Numbering is possible using a new parts marking press. The press eliminates marking with hand stamps and prevents marking with stamps in an upside-down position. It will stamp parts and tools from 1/32" up to 4" thick, with names and serial numbers. The throat depth is 4" and the table, 8" x 10". The Clearview Co., 172 Stanton St., New York 2, or — **Circle No. A44.**

NUMBERALL
CUTS THE COST OF STAMPING NUMBERS!

IMPROVED TYPE HOLDERS for stamping into Metal, etc.



STEEL TYPE

Hand or Press Style. Type can be easily, quickly loaded and unloaded. Simplest construction . . . just a sturdy pin holds the type securely. No screws nor springs. Super-quality steel type made in various sizes: 1/32" up to ½" figures and letters. Write for Bulletin TP23H.

DETAIL CHASE and PUNCH

FOR QUICK STAMPING OF NAMEPLATES

Model 24

An ingenious tool for rapid stamping of plain, etched or embossed name plates. Used in a small Kick or Power Press, or in our No. 93 or No. 131 Bench Press. Steel Type and Logo Type are dropped into recess. Logo Type are used for numerical and letter combinations.

All lines are stamped in one operation, making tool very efficient. Small, as well as large lots can be stamped economically, neatly. Write for Bulletin TP-24.

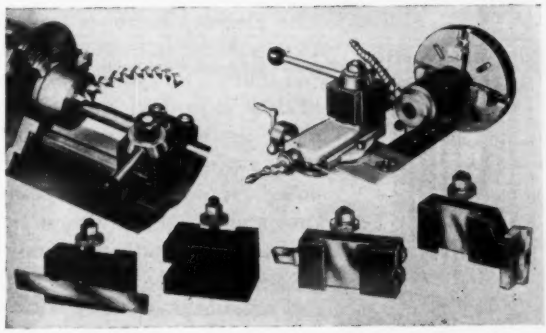
NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1651

GET THE MAXIMUM from your lathes by using the

ALORIS *"Quick Change"* patented

TOOL POST and HOLDERS



Only a second to change tools for turning, facing, drilling, boring, threading, knurling, cutting off or any other operation.

- Great Repetitive Accuracy
- Rugged Construction
- Tested and Recommended by Leading Lathe Manufacturers
- Greater Rigidity
- Saves 90% in Set-Up Time
- Unconditionally Guaranteed

Write for catalog and price list.

ALORIS TOOL CO., INC. 131-37 SANFORD AVENUE FLUSHING 55, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1652

GET ABSOLUTE *TOLERANCE HOLE DEPTH CONTROL*

with WOHLNIP NON-ROTATING DRILL STOPS

Will not mar, mark or damage the face of the work, fixture or bushing, yet give POSITIVE CONTROL OF HOLE DEPTH. Completely automatic, the WOHLNIP Drill Stop reduces human errors, simplifies difficult jobs, lowers machining cost, increases production, and eliminates rejects. Used for drilling, center drilling, countersinking, boring, milling, routing, reaming. Available with straight or taper shank, for any size drill or tool. (Patent Pending)

COLLET STOPS
(Patent Pending)

Used with collets for second operation work. Assuring consistent accuracy, permanent set-up, producing identical results. No alterations to your collets are necessary. Fully adjustable. Available for any size collets. END GUESS WORK AND REJECTS—

EXCLUSIVE DISTRIBUTORS WANTED

WOHLNIP Products, Inc.
634 Central Avenue • East Orange, New Jersey

CIRCLE INFORM-A-GRAM KEY NO. 1653

IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work *now*—save money too!

HEIMANN MFG., CO. • URBANA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1654

PRESSURELOK-224

the best diamond wheel ever developed for carbide tool grinding. Guaranteed ultimate cutting life from each diamond particle in every wheel.

UNITED STATES DIAMOND WHEEL CO.
1833 ILLINOIS AVE. AURORA, ILL.

US

IMMEDIATE DELIVERY on all wheel sizes. STRAIGHT, DISH, CUP, FLARE and MOUNTED WHEELS; HONES.

CIRCLE INFORM-A-GRAM KEY NO. 1655

Make 3 hammers AT ONCE!

It's the NEW, easy, economical, quick way to mold your own lead hammers on a production basis with "SHUR-GRIP" handles and this COOK production mold.

COMPLETE LEAD HAMMER SERVICE

Write for circular and prices

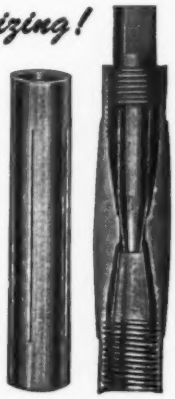
LAWRENCE H. COOK, INC.
48 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 1656

Flexolap... INSTANTLY AND ACCURATELY

ADJUSTABLE FOR FAST CUTTING AND POLISHING

...without danger of galling or seizing!



The Flexolap barrel is made with a series of longitudinal slots milled "off-center" to permit sensitively flexible expansion up to 15%—or more—under pressure of the adjusting pin. This construction enables Flexolap to save valuable time and to lap rounder, straighter holes. For accurate precision take-up, as desired, to maintain size and compensate for wear on barrel . . . simply turn adjustment screw.

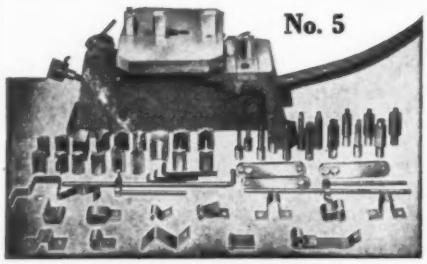
Illustrated at left is Flexolap Set No. 1. Includes 6 complete laps, one of each size (3/16", ¼", 5/16", ⅜", 7/16" and ½"), and one additional brass barrel of each size, all held on a sturdy, serviceable stand. Price complete $14.00

Also available in sizes 7/32", 9/32", 11/32", 13/32", 15/32", 9/16", 5/8", 11/16" and 3/4". For lapping holes smaller than 3/16", use the Midget Lap. Seventeen sizes: .032, .036, .040, .046, .054, .062, .070, .079, .090, .104, .120, .135, .155, .170, .187, .218, and .250. Trial assortment (17 laps) $2.10

Write today for Catalog

FEDERAL TOOL CORP. 3600 Pratt Blvd., Chicago 45, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1661



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Multiform

BENDER-CUTTER

CUTS, BENDS, PUNCHES

Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛"x1½" as illustrated. Punching and round end blanking dies available. Other models up to ¼"x4" air operated.

ALSO AIR OPERATED MODELS.

J. A. RICHARDS CO. KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1662

Anything... in THROW-AWAY INSERTS,

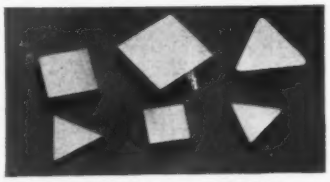
CARBIDE, CERAMIC and OXIDE

Viking

Throw-Away Inserts, all Sizes and Types in any quantity -- Our Specialty

Send prints for quotations on Negative and Positive rake Inserts. Standard Inserts carried in stock for IMMEDIATE SHIPMENT.

Write for Catalog and Bulletins.



THE VIKING TOOL COMPANY, INC.

Cutting Tool Engineers and Manufacturers

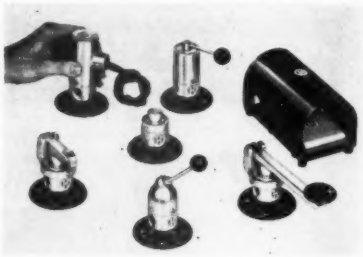
100 NICHOLS ROAD SHELTON, CT.

CIRCLE INFORM-A-GRAM KEY NO. 1663

Interchangeable Heads are featured on new-type reamers produced by Tomkins-Johnson Co., Jackson, Mich. The tapered hole in the head insures concentricity and the thread design, a snug fit on the

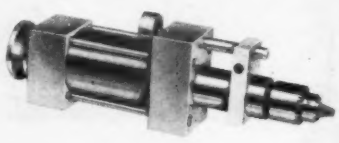
tapered shank. Heads can be quickly changed when dull or for work on different metals. A wide range is available from ½" to 2¾" in 1/16" increments with right or left hand spiral flutes for thru or blind hole reaming. **Circle No. A45.**

Applications Requiring Manual or Automatic Valving of air, water, oil or freon are handled by this line of flow control valves. The Humphrey "Quick-Dump" valves which are



available in seven models, can be used either normally open or normally closed, depending upon port connections. The opening and closing action are effected by the pressure of the air or liquid. General Gas Light Co., Kalamazoo, Mich., or — **Circle Inform-A-Gram No. A46.**

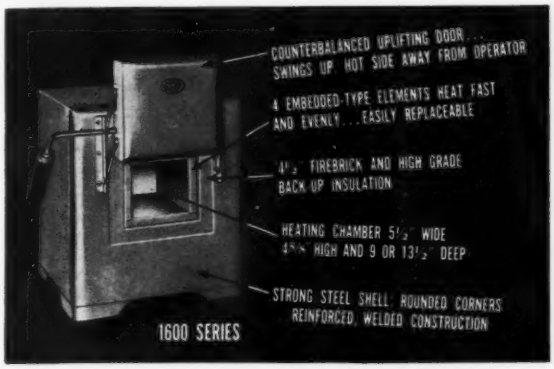
Designed to Reduce Costs of production drilling, reaming, tapping, countersinking and other machining operations which require rotary and feed motions is this drill unit. Model 150 drill unit has a ½" capacity in



steel and operates at 9000 rpm maximum. Its small size permits use in confined spaces. The unit is available in 1½", 3" and 6" strokes. Alkon Products Corp., 200 Central Ave., Hawthorne, N. J., or — **Circle Inform-A-Gram No. A47.**

SAVE HOURS, CUT COSTS: Heat treat small parts, tools, dies, etc. in your own shop or plant with a versatile, highly efficient Temco Electric Furnace.

Why tie up your big equipment on small heat treat jobs below its capacity, or why "farm out" heat treating of parts, tools, dies? Put a TEMCO bench-type electric furnace in your shop and see how it pays for itself over and over again — in time savings, cost savings, and production conveniences.


COUNTERBALANCED UPLIFTING DOOR SWINGS UP. HOT SIDE AWAY FROM OPERATOR
4 EMBEDDED-TYPE ELEMENTS HEAT FAST AND EVENLY...EASILY REPLACEABLE
4½" FIREBRICK AND HIGH GRADE BACK-UP INSULATION
HEATING CHAMBER 5½" WIDE 4¾" HIGH AND 9 OR 13½" DEEP
STRONG STEEL SHELL: ROUNDED CORNERS REINFORCED, WELDED CONSTRUCTION
1600 SERIES

Temco Furnaces are economical to own and operate . . . easy to hook up . . . easy to use. Eight models with chamber sizes from 4" x 3¾" x 3¾" to 9½" x 8½" x 18". $60 to $563 complete with controls. Write for data and nearest dealer's name.

TEMCO **ELECTRIC FURNACES**
Thermo Electric Mfg. Co.
474 Huff Street, Dubuque, Iowa

CIRCLE INFORM-A-GRAM KEY NO. 1671

RUGGED
HEAVY-DUTY HAND CLAMPS

Knu-Vise offers rugged heavy-duty clamps, with solid bar or channel bar, and either hand or air operated, for all kinds of tough holding jobs.

In addition to their stand-up stamina for rough going, these Knu-Vise Clamps feature:

1—Easy and complete replaceability of parts
2—Hardened and ground bearing bolts
3—Minute adjustment of parts through self-locking nuts
4—Toggle Bars from C.R.S. Bars

Developments like these are typical of Lapeer engineering. More information? Write for catalog today on the models available.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS **LAPEER MANUFACTURING CO.**
3064 DAVISON ROAD • LAPEER, MICHIGAN
WESTERN DIVISION: 422 Magnolia, Glendale, California • CANADIAN DIVISION: Higginson Engr., Hamilton, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 1672

INDICATING MICROMETER COMPARATOR
has the VISIBLE feel

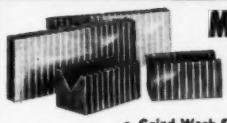
A RIGHT HAND TOOL
Release button for movable Anvil on RIGHT Hand side enables you to hold tool the conventional way.
NEW— Resetting to Zero in 5 seconds.
Quick adjustable tolerance bands.
Heavy TUNGSTEN CARBIDE Anvils will actually measure Out-of-Roundness, Ovalness & Taper.

The New No. 101 MAUSER VERNIER CALIPER

- Quick acting cam lock
- Long open face slide
- Measuring capacity 5-5/16" outside, inside and depth
- 3 graduations: 1/1000" - 1/128" and 1/10 mm in back
- Specially long Vernier to read the thousandths
- Hardened Phosphor-Bronze adjustable gib retains accuracy

MADE ENTIRELY OF STABILIZED, RUST-RESISTANT STAINLESS STEEL
The fine finish will not tarnish or deteriorate in many years of use.
New dull chrome Vernier slides finished for easy reading at no additional cost.

SPEED SURFACE GRINDING SET-UPS WITH MAGNE-BLOX



Laminated Parallels
V-Blocks &
Angle Irons

UNIVERSAL SET
$22.25 In Case
Code GANBO

- Grind Work Square
- Grind Work Parallel
- Hold Round Pieces
- Save your Magnetic Chucks
- Eliminate Clamps
- Eliminate Holding Devices

GEO. SCHERR CO., INC.
COMPLETE LINE OF PRECISION INSTRUMENTS
200-T LAFAYETTE ST. • NEW YORK 12, N. Y.

WRITE FOR FULLY ILLUSTRATED LITERATURE

CIRCLE INFORM-A-GRAM KEY NO. 1673

low cost precision stamping *with* KENCO
1½ to 15 ton
PUNCH PRESSES

Low cost because Kenco presses are quality-built *throughout* to produce at top speed, and with the least downtime you've ever experienced.

Precision stamping—a result of unusually rigid frames . . . extra long ram guides and slides that permit full use of the guiding area at the bottom of the stroke.

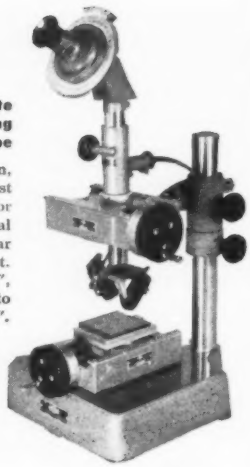
Send for full details on money-saving Kenco presses.

KENCO MANUFACTURING CO.
Mfrs. of Precision Machinery and Accessories.
5211 TELEGRAPH ROAD, LOS ANGELES 22, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 1674

Coordinate Measuring Microscope

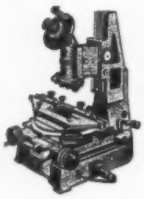
High precision, low cost instrument for 2-dimensional linear measurement. Range 2" x 2", reading to 0.0001".



Cut rejects, speed production

Fast, reliable readings to 0.0001" with Gaertner measuring microscopes

Precise, versatile, easy-to-use Gaertner measuring microscopes assure positive, direct measurement of precision parts. You see clear, sharply-defined images. No physical contact to distort or injure object being measured. Enjoy new production savings with Gaertner optical instrumentation. Write for complete data on the Gaertner line of industrial microscopes.



Toolmakers' Microscope

Ultimate in measuring microscopes. Range 2" x 4", reading to 0.0001", angular measurement to 1 minute.

Micrometer Slide Comparator

Reliable, low cost instrument for linear measurement. Ranges up to 4", reading to 0.0001" or 0.00005".

Filar Micrometer Microscope

High quality, low cost instrument for extremely precise measurements. Range 0.08", reading to 0.00002".

Write for Bulletin 161-54 showing applications, models, specifications.

The Gaertner Scientific Corporation

1224 Wrightwood Ave., Chicago 14, Ill.

Telephone: BUckingham 1-5335

CIRCLE INFORM-A-GRAM KEY NO. 1681

Miccro Spray

LAY-OUT DYE

(Purple)

MICCRO Lay-Out Dye, long the leader in its field, now available in an AEROSOL package for SPRAYING.

All the advantages—instant drying; clear, sharp lines—*plus* easy-to-use, dependable, efficient MICCRO Spray container.

•

Regular MICCRO Supreme Lay-Out and Identification Dye in seven distinctive colors available as always in brush-in-cap and conventional containers.

Write for circular on company letterhead

MICHIGAN CHROME & CHEMICAL COMPANY

8615 Grinnell Ave., Detroit 13, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1682

MAGNIFIES "HARD-TO-READ" VERNIER SCALES ON HEIGHT GAGES AND CALIPERS

MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. **LENS** is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.

Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. S No. 100 for 6" Vernier Calipers; S No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; S No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" 60" and 72" Calipers.

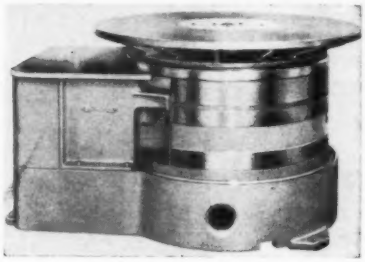
For Complete Information Write, Phone or Wire

STEBAR COMPANY

215-221 28th Ave. North Minneapolis 11, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1683

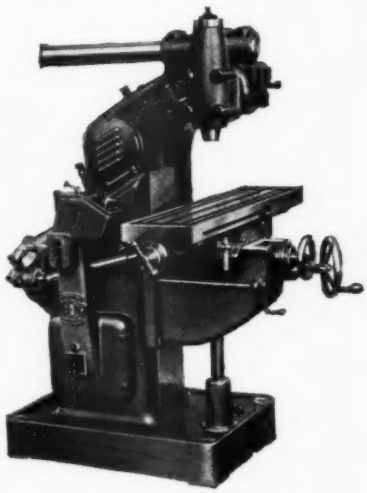
A New Indexing Machine Chassis is an aid to automating a wide range of manufacturing, processing, and assembly operations. Series H fills a need for larger diameter turret units that combine a maximum of ruggedness and accuracy. The



standard unit can easily handle turret loads in excess of 3500 lbs and has a guaranteed indexing accuracy of ±0.001" at a 60" dia. Swanson Tool & Machine Products, Inc., Erie, Pa., or — **Circle No. A48.**

Simplify Wire Coil Storage and reduce warehouse space requirements with a new line of wire coil racks introduced by Jarke Mfg. Co., 5407 N. Broadway, Chicago 40. Each rack has a 3" under clearance permitting fork-lift entrance from all 4 sides. The capacity of each rack is 4000 lbs. Three standard models are available and other sizes can be furnished to meet specific requirements. Complete details are in Bulletin R-300 issued by the company, or — **Circle No. A49.**

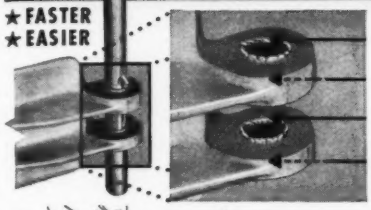
Vertical, Horizontal and Angular Milling are performed with one work setting by the Abene milling machine. It features an improved spindle drive. This Abene mill has twice



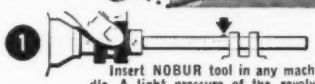
as much power resulting in faster, smoother operation. Ball Machinery Co., 939 W. Lake St., Chicago, or — **Circle Inform-A-Gram No. A50.**

HOW TO.... DEBURR THESE INACCESSIBLE HOLE FACES BY MACHINE OPERATION with the amazing NOBUR TOOL

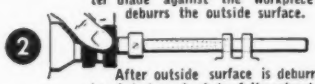
★FASTER
★EASIER



No more hand finishing methods for those hard-to-get-at inner surfaces on multi-wall parts. The NOBUR Tool with its double edge cutting blade does the job in seconds . . . all by **machine operation.** Can be used by anyone, with complete safety, on your own lathe, drill press, etc. Simple to operate.



1 Insert NOBUR tool in any machine spindle. A light pressure of the revolving cutter blade against the workpiece quickly deburrs the outside surface.



2 After outside surface is deburred, slide knurled sleeve back to fully retract the cutter-blade below pilot body diameter.

3 With cutter-blade retracted move workpiece or tool to position for deburring inside surface. Raise cutter-blade to deburr first one surface then the other.

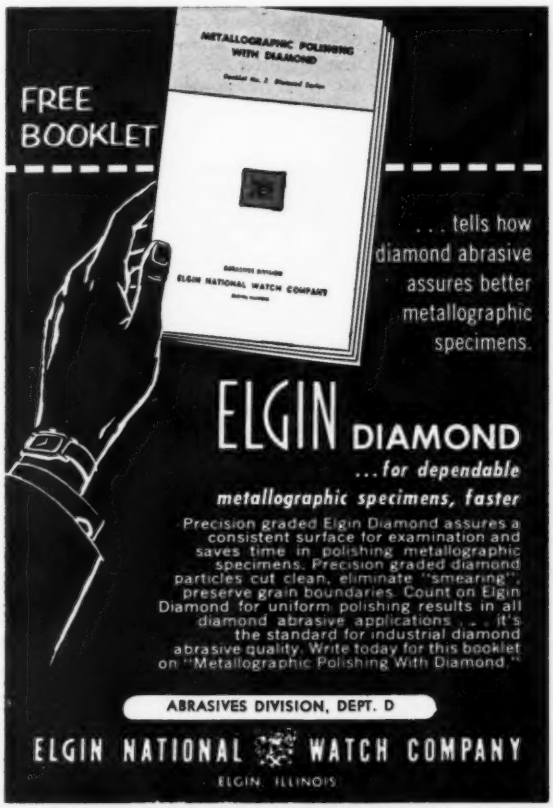
Write for FREE Folder
Send for all details on Nobur Tool Products TODAY!

N-11

NO/BUR TOOLS **NOBUR** MANUFACTURING CO.
6860 Fairdale Ave., No. Hollywood, California

CIRCLE INFORM-A-GRAM KEY NO. 1691

FREE BOOKLET



. . . tells how diamond abrasive assures better metallographic specimens.

ELGIN DIAMOND
. . . for dependable metallographic specimens, faster

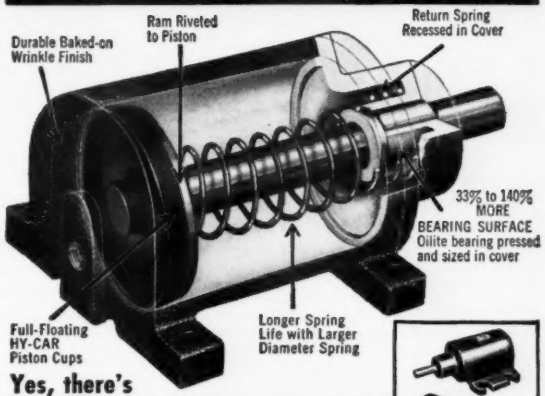
Precision graded Elgin Diamond assures a consistent surface for examination and saves time in polishing metallographic specimens. Precision graded diamond particles cut clean, eliminate "smearing", preserve grain boundaries. Count on Elgin Diamond for uniform polishing results in all diamond abrasive applications . . . it's the standard for industrial diamond abrasive quality. Write today for this booklet on "Metallographic Polishing With Diamond."

ABRASIVES DIVISION, DEPT. D

ELGIN NATIONAL WATCH COMPANY
ELGIN, ILLINOIS

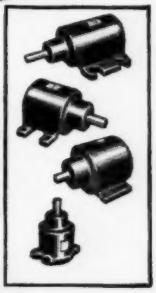
CIRCLE INFORM-A-GRAM KEY NO. 1692

SINGLE-ACTING CYLINDERS COST LESS: to buy, to use!


Durable Baked-on Wrinkle Finish
Ram Riveted to Piston
Return Spring Recessed in Cover
33⅓ to 140⅔ MORE BEARING SURFACE Oilite bearing pressed and sized in cover
Full-Floating HY-CAR Piston Cups
Longer Spring Life with Larger Diameter Spring

Yes, there's no doubt that simple, spring-return air cylinders are cheaper to start with, and use only half as much air as double-acting cylinders. The valves and hookups are simpler and cheaper, too.

What's more, MEAD distributors carry local stocks for *immediate* delivery in six bores from 1" to 6", six stroke lengths from ½" to 3", and three mountings. Write now for single-acting cylinder catalog HA-86.



MEAD

SPECIALTIES CO., 4114 N. Knox, Dept. HA-86, Chicago 41, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1693

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DRILL PRESS AND ANGLE VISES

Can speed up production, solve difficult angle jobs in your plant. Used in all industries—everywhere.

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Drill Press Vise
1½" Jaw width, $6.95

No. 30
Drill Press Vise
2½" Jaw width, $8.95

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Drill Press Vise
3" Jaw width, $10.95

No. 14
Drill Press Vise
4" Jaw width, $19.95

No. 000
Angle Vise
2½" Jaw width, $14.70

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Angle Vise
4" Jaw width, $39.95

NO 114

There are 64 different models and types of Palmgren vises, rotary tables, milling attachments and other machine tool accessories, comprising the most complete line of vises and tables available anywhere, with jaw sizes from 1½" to 8". **Send for catalog 204 for complete line,** showing details and prices.

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8388 South Chicago Ave. • Chicago 17, Illinois

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For Better Knurling

NEW

KNURLMASTER

Hand Knurler

$13.50

No distortion — even on ⅛" stock! MODEL "C"

For small production runs on ⅛" to 1" stock. Exclusive screw design gives perfect knurl pattern. Furnished with 3 hardened knurls of standard ½" dia. Forged steel frame is self-centering. Write for illustrated folder.

DEALERS INQUIRIES INVITED

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80A Magnolia St., Westbury, L. I., N. Y.

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STEP RIGHT UP FOLKS FOR A FREE HELPING OF STINGING CHIPS ···
GET 'EM WHILE THEY'RE GOOD 'N' HOT!!
ENOUGH OF THAT! THE BOSS WANTS YOU TO USE THIS DILLEY MAGNETIC GRIP SHIELD!!
HERE! SLAP IT ONTO YOUR MACHINE AND YOU'LL SAVE EVERYBODY FROM CUTS AND BURNS!
NEXT DAY···
JOE'S PRODUCTION HAS DOUBLED AN' EVERYBODY'S SAFE AN' HAPPY!!
FINE! I WANT "DILLEYS" ON EVERY MACHINE IN THE PLACE!

$10.00 wouldn't pay for the paper work on one chip-produced accident in most plants.

Magnetic Grip-Shields are so reasonably priced your plant can't afford an accident.

You try 'em — You'll like 'em. The guard with 101 uses.
Write today for folder with prices.

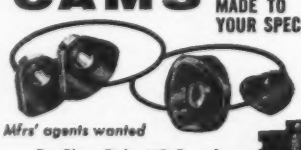
THE DILLEY MFG. CO. 1633 Ansel Rd., Cleveland 6, O.

CIRCLE INFORM-A-GRAM KEY NO. 1702

DYKEM STEEL BLUE
SPECIMEN
With DYKEM Steel Blue
Without DYKEM Steel Blue
DYKEM STEEL BLUE
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.

CIRCLE INFORM-A-GRAM KEY NO. 1703

CAMS ALL TYPES MADE TO YOUR SPECS



Mfrs' agents wanted

Dr. Chas. Eisler ME, Founder
Chas. Eisler, Jr., Pres.

EISLER ENGINEERING CO., INC.
732 SO. 13TH ST. NEWARK 3, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1704

Low Cost Automatic
HORIZONTAL STOCK REEL
Self-powered

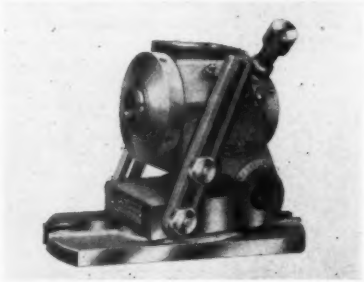
24" dia. $85.00
30" $90.00
36" $95.00

Write for details

JACO DEVICES, INC.
96 High St., Hingham, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1705

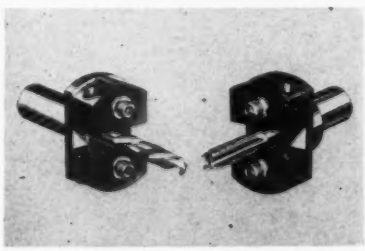
Fast, Accurate Indexing with the elimination of possible indexing error in milling, machining, and grinding of parts is a feature of the redesigned universal dividing collet head. The tool uses interchangeable index plates in a range of 2 to



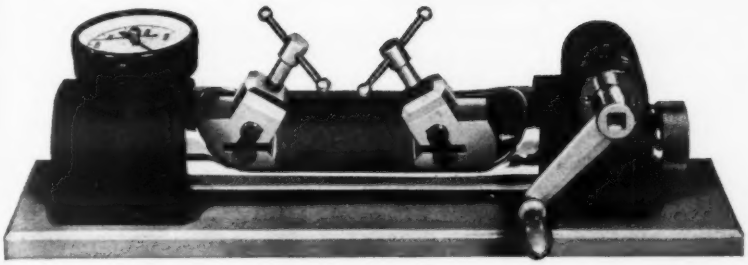
36 spaces instead of the conventional dividing head indexing plate with several hundred holes. Model C-404 dividing collet head is used in the manufacture of duplicate parts which need indexing, etc. Kuma Tool Co., 4712 S. Kenwood Ave., Chicago 15, or —
Circle Inform-A-Gram No. A51.

Standard Triangular and square throwaway inserts and Styles P and H inserts are included in the new series of carbide inserts added to the line of laboratory grade cemented carbides by Firth-Loach Metals, Inc., Buttermilk Hollow Rd., McKeesport, Pa. The triangular inserts in six sizes and three grades, are suitable for both general machining work and fine finishing. Styles P and H inserts are used for a wide variety of machining operations. The throwaway inserts are carried in four sizes ranging from ⅜" x ⅛" to ¾" x 3/16". Details are in Catalog 2.
Circle Inform-A-Gram No. A52.

A Pair of Independently Mounted Sliding Jaws which provide 4-point holding for greater strength are utilized by 3 new adjustable tool holders. The holders eliminate the need for accessories such as bushings and collets. RoyEL Tools, 4221 Excelsior Blvd., Minneapolis 16, is



the manufacturer of a drill holder for automatic and hand screw machines, a non-releasing tap holder for automatics, and a releasing tap holder for hand machines.
Circle Inform-A-Gram No. A53.



For shop or field—a new

Portable Tensile Tester

Use this compact, precision tensile tester to test strip steel, wire, bolts, spot welds, or anything else within its 4,000 lb. capacity. Besides its use for inspection work in the shop, this portable device provides a convincing method of demonstrating the tensile strength of various materials in sales demonstrations and trade shows.

Only a moderate pull on the crank is sufficient to apply the maximum load. Results are easily read from the load gauge. Simple to use, anywhere, any time. Write for catalog sheet and price.

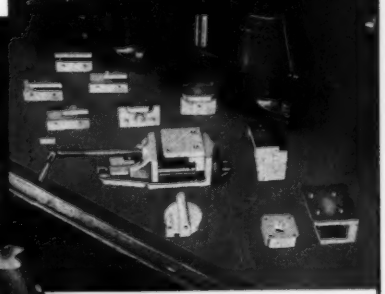
DETROIT TESTING MACHINE COMPANY

9386 Grinnell Avenue Detroit 13, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1711

Speed Versatility and Economy

Tooling costs go down when Speed Vise goes on the job because Speed Vise eliminates the need for expensive jigs and fixtures. Just a simple jaw plate to fit the part being drilled and Speed Vise does the rest. Several interchangeable Speed Vise jigs and fixtures can be made for the cost of one old style box type jig. The operation of Speed Vise tooling is **many times faster** than the operation of such conventional jigs and fixtures. Speed Vise tooling is economical to build, efficient to use, compact to store.



SPEED VISE GIVES YOU 100 JIGS IN ONE

$10.90 to $22.90

- ★ Quick action design for speed. Opens instantly to full capacity to handle work of any size.
- ★ Standardized holes for attaching jigs or jaw plates.
- ★ Lift...slide...lock...that's all there is to the fast, positive locking action.
- ★ Heavy, semi-steel castings for extra strength and a heavy base plate for rigidity.

Write or wire now for information

CARDINAL MACHINE COMPANY

1819 Dana Street, Glendale, California

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SUPERBORE Counterbores

NEW!

30° Right Hand Spiral, 4 Flute

Now you can speed up production 100% with our *New* 30° fast right hand spiral, four-flute counterbores.

You will find that faster feeds are possible with this freer-cutting tool.

Hardened counterbore blanks in stock can be ground to any special pilot and flute diameters in one week.

FREE!

Complete Reamer catalogue with world's Greatest Reamer selection by the Thousands' and thousandths. Write for it today!

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FOR *Fast, Low Cost* DRILLING OF HARDENED STEEL, USE

ACE

"HI-BRINELL" DRILLS

When it comes to drilling hardened ferrous materials in the range of 45 to 65 Rockwell "C" and harder, you can't beat Ace "Hi-Brinell" Drills. They're designed especially to handle tough jobs that ordinary drills won't touch. Ideal for salvaging and repairing hardened steel parts . . . a "must" for every tool room, die shop, machine repair department. They're built to give you extra long service life, too. The tungsten carbide tips have ample negative rake to eliminate thin projecting angles and permit faster, easier cutting. And they're stocked in a wide range of sizes and lengths to meet your particular requirements. Call your Ace Distributor or send for complete information today!

ACE DRILL CORPORATION
Adrian, Michigan

Gentlemen: Please send me your Catalog No. 52-A containing complete information on ACE "Ground-from-the-Solid" Drills and hardened H.S.S. drill blanks.

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COMPANY_____

ADDRESS_____

CITY_____ STATE_____

ACE DRILL
ADRIAN, MICHIGAN
ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

CIRCLE INFORM-A-GRAM KEY NO. 1721

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LIVE CENTERS
ARE
• ACCURATE • VERSATILE
• HEAVY DUTY

THE TAPERED SEAT ASSURES ACCURACY OF ±.0001

Manufactured in all tapers. 1 to 6 MT in stock. Special shanks and points made to order.
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Points illustrated are standard.

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IT MAGNIFIES
IT ILLUMINATES
IT MAKES SEEING EASY

WHATEVER YOU WANT TO SEE
appears under the Magni-Ray enlarged in every detail, in true perspective, and drenched, flooded with light as intense, as revealing that it is in itself practically as effective as another degree of magnification. The subject of your inspection can have no secrets from the Magni-Ray.

IMMUNE RAYS MAKE SCRATCHES & DEFECTS STAND OUT CLEARLY — GENUINE OPTICAL GLASS LENSES

HEAVY ADJUSTABLE BASE REMOVABLE LENS HOUSING FOR INSPECTION OF LARGE SURFACES, ENGINES, ETC.

3 MODELS AVAILABLE PRICED $23.50 TO $35.00
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200-T LAFAYETTE STREET • NEW YORK 12, N. Y.

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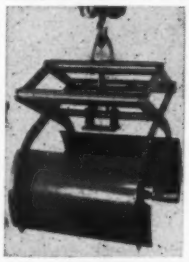

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FAST • SAFE • BETTER
Material Handling
of
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400 MODELS
Prompt Delivery
Write for full particulars

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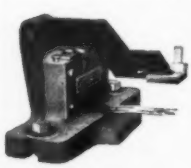
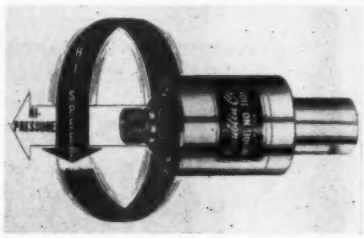


New Low Cost
AUTOMATIC SCRAP CHOPPER
3" wide $69.00
6" wide $95.00
12" wide $195.00
Write for details

JACO DEVICES, INC.
96 High St., Hingham, Mass.

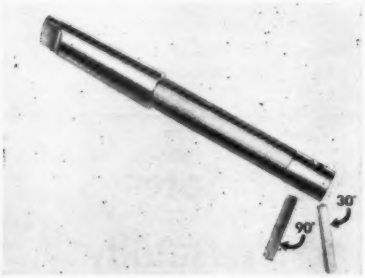
CIRCLE INFORM-A-GRAM KEY NO. 1725

Facilitate Gun Drilling and Gun Boring with a Hi-Speed coolant union designed for introducing coolant under high pressure to cool the cutting edge of the tool and flush chips from the hole. The union features balanced seal design to assure a longer seal life because the



micro-lapped sealing faces are held together by a constant minimum pressure and line pressures cannot increase the load on the faces. Deublin Co., Glenview, Ill., or — **Circle Inform-A-Gram No. A54.**

Two Square Tool Bit Holes are incorporated in each of these new standard boring bars. Incorporating both 90° and 30° tool bit holes permits increased versatility. Rough and finished spot facing, back spot facing, bottom and through boring,



counterboring, and back counterboring operations can be performed with 50% to 75% less boring bar inventory. Beaver Tool & Engineering Corp., Box 429, Royal Oak, Mich., or — **Circle Inform-A-Gram No. A55.**

A Full ¼" of Adjustment for any size hole from ¼" to ½" dia is a feature of Model No. 1 small diameter bore gage. Fixed pin equalizers insure positive centralization in any

hole within its capacity. Only three range extensions are needed. The gage is set by screwing in the threaded range extensions. Boice Gages, Inc., Staatsburgh, N. Y., or — **Circle Inform-A-Gram No. A56.**

HIGH SPEED PRODUCTION DRILLING OF VERY SMALL HOLES...

is accomplished more efficiently, more economically with a drilling machine specifically designed for this type of work.

Electro-Mechano 8" drill presses include all those features which years of experience have proven to be best for profitable operation in the drilling range of .004" to 5/32".

Write NOW for Descriptive Bulletin!

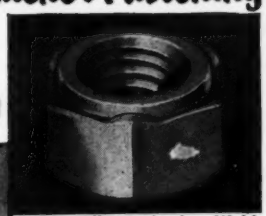
The ELECTRO-MECHANO Co.
260 E. Erie St.
MILWAUKEE 2, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1731

WHEN YOU NEED Quicker Fastening FOR

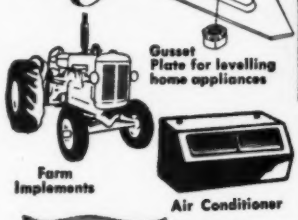
- Blind Assemblies or
- Extra Threaded Depth at less cost...

use one of these 2 WELD NUTS



Gripco Pilot-Projection Weld Nut. Circular pilot designed for quick, easy positioning of nut over bolt hole for instant resistant welding. No jigs, no fumbling, no waste of time. Furnished with or without famous Gripco locking feature.

Gripco Countersunk Weld Nut. Eliminate time-wasting retapping of nuts after welding. Exclusive countersunk nut bottom does away with fouling of nut threads by weld spatter. Available with or without Gripco locking feature.



Write for sample and full details. NO. 114

GRIP NUT COMPANY
107 Maple Ave., South Whitley, Ind.

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MILLING MACHINE SPACING COLLARS

SAVE TIME ON GANG MILLING SET - UPS

These MICROMETER ADJUSTABLE SPACING COLLARS are designed for accurate spacing of side milling cutters, gang milling and various other multiple setups on milling machines. Accurate spacing of the milling cutters is easily made by merely loosening the cutter arbor nut and making a plus or minus adjustment.

You will be assured of a QUICK, ACCURATE and POSITIVE ADJUSTMENT at all times.

For immediate delivery specify size and mail orders to . . . . . .

Size of Cutter Arbor	Maximum Outside Diameter	Price
⅞	1-9/16	$12.75
1	1-13/16	12.75
1¼	2-1/16	13.25
1½	2-7/16	13.25
1¾	2-3/4	16.75
2	3-1/16	19.50

DAYTON ROGERS *Manufacturing Company*
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WORLD'S LARGEST LINE OF WORK HOLDING EQUIPMENT—CHUCK JAW BLANKS, CAST ALUMINUM AND MALLEABLE KNOBS, WHEELS, HANDLES—PLUS HUNDREDS OF OTHER JIG AND FIXTURE COMPONENTS

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Dept. TE-8 712 E. 163rd St., Cleveland 10, Ohio

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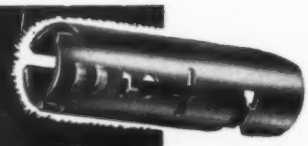

12¢ or 4¢ to make this metal part?

This is a door handle tube, but it might be any of a hundred metal components or products. A big lock manufacturer was making it in his own plant at a cost of 12¢—until A. K. Tool, specialists in metal parts fabrication, undertook to turn it out for him for just 4¢.

Many of the nation's foremost manufacturers have found it cheaper, simpler to leave fabrication of their metal components to A. K. Tool Co.

Why not investigate—today—the production facilities and know-how that may effect substantial savings in your metal parts production?

Write or phone

Telephone: WEstfield 2-7300

A. K. TOOL CO., INC.
Highway No. 22 · Mountainside 5, New Jersey

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DEPENDABLE ACCURACY

INSPECTION TOOLS made of MEEHANITE METAL are designed to fill your various Inspection and Checking needs. Sturdily constructed to give you reliable, accurate service.

Surface Plates — Box Parallels
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Universal Right Angles
Flat Parallels — Lapping Plates
Toolmaker's Knees — "V" Blocks
Straight Edges (Bridge Type)
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Masterangle Plates
Angle Attachments

Send For Bulletin

ACME TOOL COMPANY
75 W. Broadway, New York 7, N. Y.

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DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Penna.

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HARDNESS TESTING
has been done with the SCLEROSCOPE
Since 1907

THE SHORE INSTRUMENT & MFG. CO., Inc.
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Jamaica 35, N. Y.

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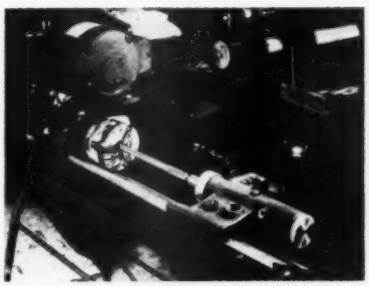
Automatically Wash, Rinse, Rust-Protect, and Dry small metal parts such as acorn nuts, screw machine parts, fittings, etc. with the "Roll-O-Matic Metal Laundry". It not only removes oils, but also loose chips, thus eliminating hand scrubbing and air blow off. The machine

can be fabricated to accomplish as many chemical or liquid stages as required. For complete information, write to Dept. TP, Magnus Chemical Co., Inc., Equipment Div'n, Garwood, N. J., or —
Circle Inform-A-Gram No. A57.

110 Models, with capacities from 500 to 200,000 lbs, are included in the line of Hydroscales produced by Hydroway Scales, Inc., 20624 W. 8 Mile Rd., Detroit 19. These heavy-duty scales can be used on any standard crane or hoist equipment. The Hydroscale is installed on the crane hook and whenever a load is lifted, it is automatically weighed in one operation. All models are equipped with minus tare adjustment for known tare loads.
Circle Inform-A-Gram No. A58.

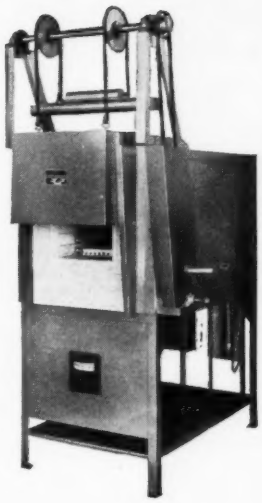
Eliminate Costly Hand-Setting and driving dogs with the Dead Eye Center-All chuck work head. This hydraulically or pneumatically operated chuck is self-compensating with each jaw operating independently of each other. It automatically centers and compensates for rough work that



has the centers off the center line ⅜" or that is accentric by as much as ¾". The chuck which has a range from 3/32" to 27/32", is used for all cylindrical grinding, lathes, milling machines, etc. Modern Devices, Box 429-TP, Libertyville, Ill., or —
Circle Inform-A-Gram No. A59.

"MULTI-INSULATION" is the secret of...

HUPPERT
Floor Model
FURNACES



These sturdy production type Huppert electric furnaces not only attain highest efficiency, but also cut operating costs to a minimum through the unique Huppert method of using multi-insulation surrounding all sides of the heating chamber. Heat range—continuous up to 1850° F., intermittent operation to 1950° F., can also be built for 2300° F. operation. This furnace comes complete with an indicating electronic temperature controller, and a tight seating, wedge-type door is used. Standardly furnished for 220 V. A.C. single or 3 phase operation. (110 V. or 440 V. models to order.)

This model built in 20 different sizes

Model No. 16 Illustrated
12"x8"x18"—$1014.00 complete

Write for literature on complete line of Huppert furnaces and ovens.

K. H. HUPPERT COMPANY
6820 Cottage Grove Avenue, Chicago 37, Illinois
Manufacturers of Electric Furnaces and Ovens

CIRCLE INFORM-A-GRAM KEY NO. 1751

100 TO 40,000 POUND COIL CAPACITY
LITTELL REELS

No. 25-18—Littell Motor Driven Automatic Centering Reel With Arm Control. Coil Capacity, 2,500 lbs.

Ask for a Littell Coil Weight Calculator

Whether you feed stock from 100 pound coils or 40,000 pound coils, there is a Littell Automatic Centering Reel to meet your needs . . . motor driven, electric brake and plain brake reels. Every Littell Reel is designed for swift, safe coil replacement and smooth, *controlled* uncoiling. All models combine smooth running accuracy with rugged construction that assures *extra* years of dependable service.

Write for Littell Reel Catalog Data

F. J. LITTELL MACHINE CO.
Speed with Safety

ROLL FEEDS • DIAL FEEDS
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REELS • AIR BLAST VALVES
District Offices: Detroit, Cleveland

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HIGHER SPEEDS! FASTER GRINDING!
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AIR GRINDERS

Model JA
50,000 R.P.M.
$42.00
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle. That means better work—longer wheel life.

High speed grinding with small wheels was a Madison-Kipp development of the late twenties. It was born out of a pressing need in our tool room. Because tool room grinding problems are universal, we believe it will pay you to utilize Kipp grinders in your tool room as generally as we do in our own.

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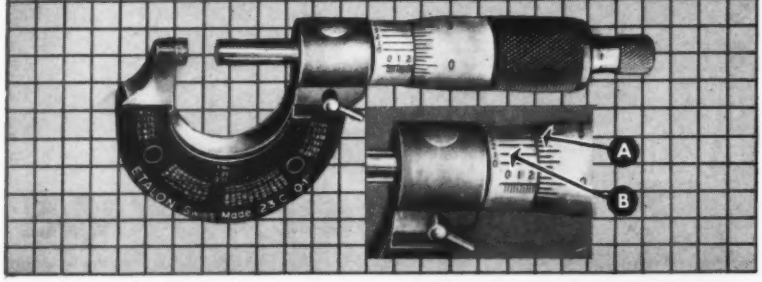
212 Waubesa St. • Madison 10, Wis., U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1753

ONE PIECE STAINLESS STEEL SPINDLE AND SCREW
Hardened and ground from the solid . . .



ETALON 23C MICROMETER

A—Half-thousandth graduations on thimble allow tenths readings with only 5 Vernier graduations.

B—Deep machine divided graduations on both thimble and barrel assure easy reading.

• Reads to .0001" • Forged frame • Heavy duty tungsten carbide measuring faces, optically lapped • Quick acting positive lock • Feather touch friction stop assures senstive feel • Dull chrome finish on thimble and barrel eliminates glare • Built for accuracy under the most rugged applications • In handsome contour case.

WRITE FOR CATALOG on complete line of precision measure instruments:
VERNIER CALIPERS • MICROMETERS • DIAL INDICATORS

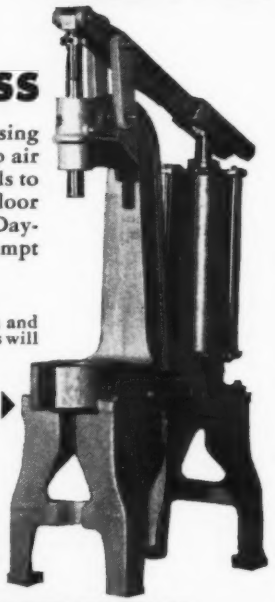
ALINA CORPORATION
401 Broadway, New York 13, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1761

SAVE!

WITH A
HANNIFIN AIR PRESS

It's the ideal press for that occasional pressing job. These presses operate off ordinary shop air supply. They're fast and safe. Over 30 models to choose from...many for either bench or floor mounting. Capacities from ½ to 18 tons. Daylight to 46 inches...reach to 12 inches. Prompt delivery.



WRITE. Complete information and prices on Hannifin Air Presses will be sent on request.

6 Tons (Model B-2) One of more than 30 models. Press with base, $519.

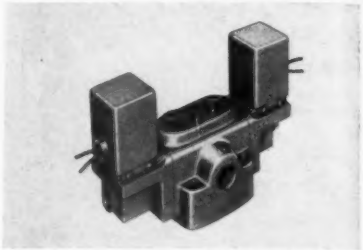
1-ton Hand-D-Press. For small parts manufacturers. Press only, without valves, $23?.

Prices F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

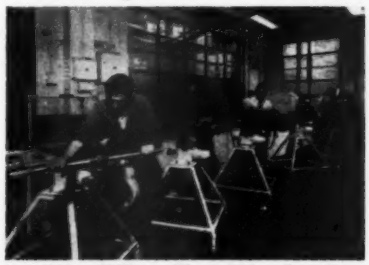
HANNIFIN CORPORATION, 563 S. WOLF ROAD, DES PLAINES, ILLINOIS
CIRCLE INFORM-A-GRAM KEY NO. 1762

Operating Pressures up to 1500 Psi are a feature of 9500-9600 Series 1500-lb hydraulic control valves. They also have heavy-duty continuous service solenoids and subplate mounting or tapped ports and are



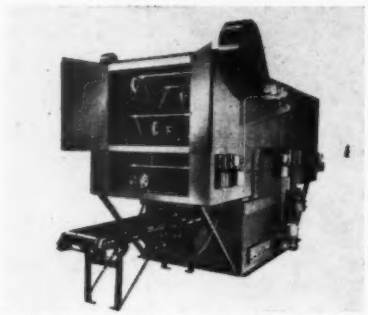
pilot-operated, compact and easily serviced. They are available as 2- or 3-position, 4-way types in a range of sizes from ¼" to 1". For details get Catalog 200, Section 7 from Logansport Machine Co., Inc., Logansport, Ind., or —
Circle Inform-A-Gram No. A60.

Increase Production and Save Space with a work positioner that adjusts to any angle in all three planes and locks in position. The PowRarm positioner is manufac-



tured by Wilton Tool Mfg. Co., Inc., Schiller Park, Ill.
Circle Inform-A-Gram No. A61.

High Production Cleaning of Small Metal Parts is handled by a crossrod conveyorized degreaser. Automatic feeding is accomplished by a motorized conveyor belt at the loading end. Another motorized conveyor at the unload end takes the work off. The



unit is available in either electric, steam or gas heated models. Conveyor speed is about 8 ft/min and capacity, 3000 lbs of work/hr. Phillips Mfg. Co., 3445 W. Touhy Ave., Chicago 45, or —
Circle Inform-A-Gram No. A62.

HAVE YOU CHECKED YOUR COUNTERSINKING COSTS LATELY?
A Severance CARBIDE ECONO-SINK WILL GIVE YOU —
INCREASED ACCURACY
MORE PRODUCTION
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AND A COMPLIMENT FROM THE BOSS FOR SUGGESTING THE CHANGE
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ROCK OF AGES

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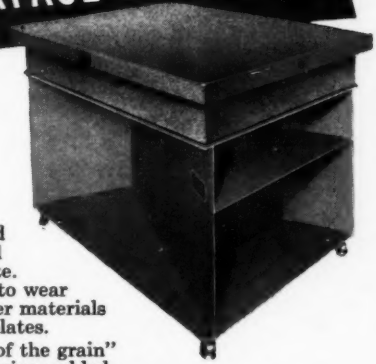

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All Bryant Surface Plates are manufactured from fine-grained *true quartz* granite. Their resistance to wear surpasses *all* other materials used as surface plates.

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Full range of sizes available from the same selected black-and-white true granite, in precision, standard and layout accuracies.

Convenient stands feature both utility and appearance.

Write for quotation, stating size and accuracy desired

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Granite Surface Plates • Groove Gages • Internal & External Thread Gages
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DIVISION OF BRYANT CHUCKING GRINDER COMPANY

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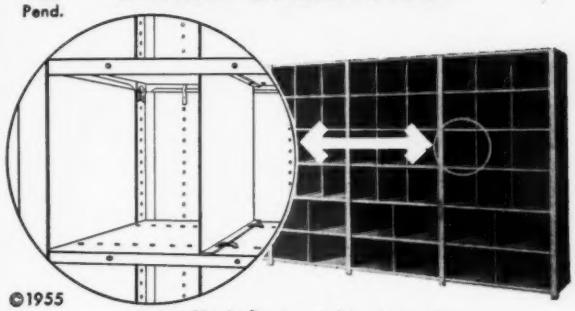
THE NEWEST AND BEST IN SHELVING!

KLIP-BILT®

STEEL SHELVING

Pat. Pend.



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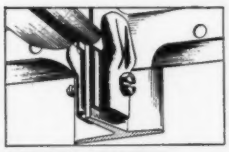
installed fast without tools . . .
combines high strength with
low installation cost

KLIP-BILT, the revolutionary new boltless steel shelving, provides the fastest, simplest assembly of high strength storage equipment yet developed!

All fastening is with simple clips . . . easily installed by hand yet ingeniously designed to hold shelves, panels, dividers, and T-posts of various thicknesses pressure tight. Clips can be quickly disengaged, too, to permit easy rearrangement or disassembly of shelves.

Manufactured in standard sizes and parts.



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SHELF CLIP

Just three parts for quick installation. Hardened cadmium-plated threaded stud and two heavy steel clips, one having stamped thread. Holds shelf flange *tight* against tough, rail steel T-post to prevent shelf from sagging when heavily loaded.

PANEL CLIP

Secures back panels to shelf flanges. Engaged at each shelf level. Quickly installed from *in front* of shelving.

DIVIDER CLIP

Locks into two shelf holes to provide firm anchorage. Clips are flat, do not interfere with storage.

A SHELF FOR EVERY LOAD

A. For average loads
B. For heavy loads (Front and rear flanges reinforced.)
C. For extra heavy loads (Type B with sides and center reinforced.)

Label holders clip to shelf.

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Specialists in Storage Planning and Manufacture of Storage Equipment.

CIRCLE INFORM-A-GRAM KEY NO. 1773

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"How to Choose and Use Them" is subject of FREE 24-page guide book.

Written expressly for engineers, production executives and inspection supervisors, this 24-page illustrated handbook is entitled "INDUSTRIAL MAGNIFIERS—How to Choose and Use Them." Theme of this informative booklet is "Fit the magnifier to the job." It is filled with information to help select the proper magnifier for the job — and by skillful selection and use, to obtain the best possible solution to your problems.

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Give Up to 25% Longer Life

"Raymac" solid carbide rotary files are hand cut, lapped, held to close tolerances and manufactured from Dexco's select carbide stock. This gives you a solid carbide rotary file with longer life, no center dead spots and perfect balance at high speeds.

"Raymac" gives you a complete line of standard carbide rotary files. For your special jobs, Dexco's skilled craftsmen will custom build Raymac solid carbide rotary files to your own specifications. It's "Raymac" for the finest in solid carbide cutting tools. Write or call us today.

"Raymac" Division DEXCO CORPORATION
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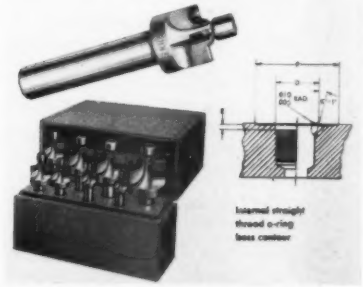
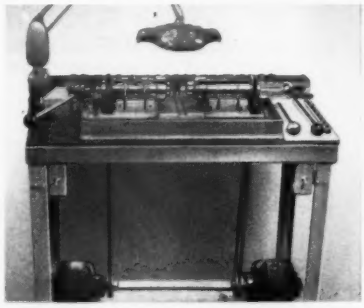
CIRCLE INFORM-A-GRAM KEY NO. 1782

Cut Standard Internal O-Ring Boss for straight thread tube fittings with a carbide-tipped port contour cutter. The tool has four flutes which form the complete contour as the tool is



fed into the drilled hole. This SAE port contour cutter is available in 13 diameters for all sizes of fittings used with ⅛" through 2" dia tubing. Sonnet Tool and Mfg. Co., 578 N. Prairie Ave., Hawthorne, Calif., or — **Circle Inform-A-Gram No. A63.**

Consecutive Hole Finishing Operations with multiple tooling, without removing the workpiece from the machine is possible with a new horizontal type drilling machine. The



machine has multiple tool quills to perform a series of operations including drilling, chamfering, reaming, etc. without removing the workpiece or the individual tools. Jedco, Inc., 3980 Superior Ave., Cincinnati 36, or—**Circle No. A64.**

Tiny Carbide Dowel-Pin Reamer has been designed specifically for reaming operations in die hardened steel from 45 to 65 C Rockwell. It eliminates the need for grinding, lapping or honing. The reamer can also

be used for enlarging or reaming operations in other hardened parts. It is available in ¼", 5/16", ⅜", ½", ⅝" and¾" dia and in sets. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich., or — **Circle Inform-A-Gram No. A65.**

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Square Bits

Round Bits

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Many Bit Sizes!

Clark LATHE TOOL HOLDERS do the *USUAL* and *UNUSUAL* JOBS BETTER IN EVERY SHOP—*SOLIDLY GRIP* ROUND, SQUARE and RECTANGULAR SHAPES—Enable turning, threading, boring with bars as well as cut-off operations with *ONE* tool holder!

Special vee clamp operating on diagonal accommodates several bit sizes, grips *full length of the cutter channel*. Holds bits tighter, eliminates chatter and harmonic vibration. Excellent rigidity for carbide tools!

4 Clark Lathe TOOL HOLDER SIZES cover complete range of lathe requirements from ⅛" bits to ⅝" bits. Write for prices or order from your dealer.

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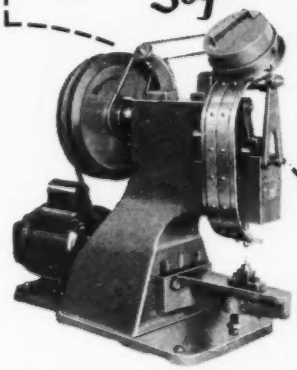
Best and fastest for Printed Circuits!

Edward Segal

AUTOMATIC EYELET ATTACHING MACHINERY



Eliminates costly tool breakage

The Edward Segal Adjustable Travel Spindle (Patent Pending) permits you to set eyelets as tiny as .032" I. D. without fear of costly tool breakage. It is designed to keep the spindle from contact with the pilot at the time the eyelet is delivered to the set die...is built right into the Edward Segal Model NR eyelet attaching machines.

What's *your* eyeleting problem? Printed circuits are just *one* successful application for Segal equipment which is used in hundreds of plants in all fields.

Submit your specs for analysis today, and write us for our interesting booklet loaded with eyelet setting data, # 70

EDWARD SEGAL • 72 SPRING STREET, NEW YORK 12, N. Y.
Eyeleting machinery, special hoppers & feeding devices

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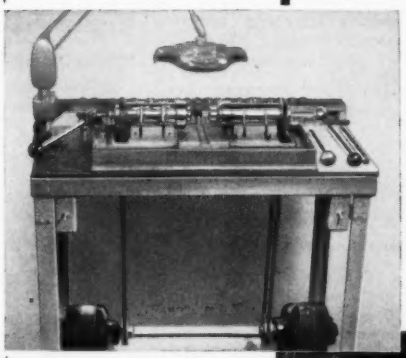
NOW POSSIBLE!

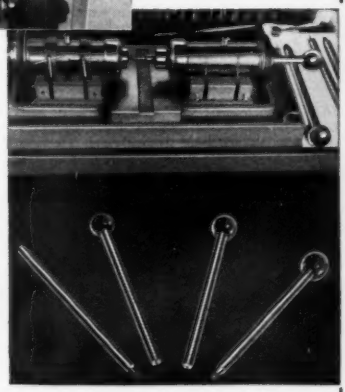
CONSECUTIVE OPERATIONS WITH MULTIPLE TOOLING -

Without removing workpiece from work spindle



JEDCO MICRO-DRILLING MACHINE

★



For Drilling Holes Parallel To A Cylindrical Axis

At last . . . a micro drilling machine with MULTIPLE TOOL QUILLS . . . allowing a series of operations — drilling, chamfering, reaming, etc. — to be done consecutively without need of removing workpiece from work spindle.

OR . . . with suitable attachments, another model can be used to drill holes on rectangular coordinates to an accuracy of plus or minus .0005.

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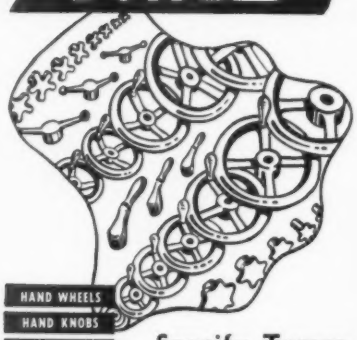
Tomco



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PREWO PRECISION MACHINE VISES

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No Lifting of Jaws
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Workpiece Held More Securely

★HIGHER ACCURACY
Various Types: For Milling and Drilling Machines; also Quick Clamping Vise With and Without Swivel

Highest Precision Toolmakers' Universal Vises for Any Compound Angle Set Up with Gage Blocks

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Enco Self-Indexing HEXTURRET Cuts Production Costs!

- Double Drive Gears
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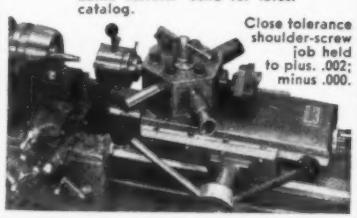

Close tolerance shoulder-screw job held to plus. .002; minus .000.

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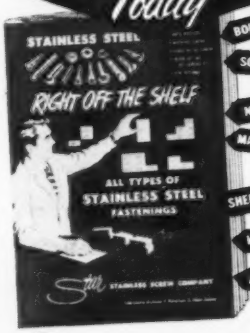

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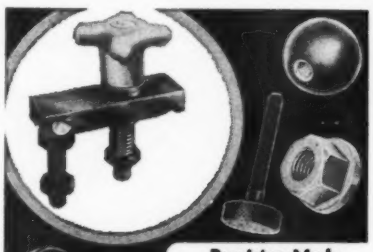

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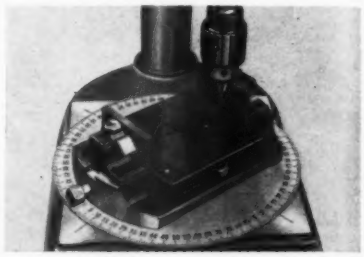
This Simplified Drill Press Vise speeds up all types of drilling operations, layout and spacing work, light milling, routing or mortising, without swinging table or head of drill press to locate the exact position of



the work. One of the two self-locking movable jaws can be swiveled to grip irregular work. The work can be tightened without using a key or wrench. K-Vise Co., Inc., 115 Farrand Ave., LaPorte, Ind., or —
Circle Inform-A-Gram No. A66.

Two New Sizes have been added to the Weddell line of boring bar adaptors to accommodate ¼" and ⅜" inscribed circle solid carbide triangular inserts. Sizes TB8 and TB12 are used in turning toolholders. Cylindrical adaptors with broached triangular holes are available for use in boring tools and special holders. Weddell Tools, Inc., 37 Centennial St., Rochester 11, N. Y., or —
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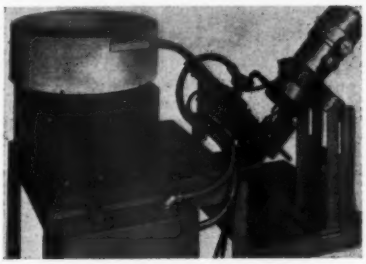
Deburr Metallic or Non-Metallic Parts Automatically with a small machine built by The Klaas Machine



and Mfg. Co., 4314 E. 49th St., Cleveland 25. A hopper feeder positions the part so that the face to be machined is upward.
Circle Inform-A-Gram No. A68.

Check and Inspect Contoured Surfaces quickly and accurately with the Contour-O-Scope measuring instrument. It checks the dimensional radial accuracy of parts such as impellers, inducers, defusers, two and three-dimensional cams, etc. The instrument eliminates the need for intricate setups and layouts. Summit-Roberts Products, Inc., 830 New York Ave., Toledo, O., or —
Circle Inform-A-Gram No. A69.

ACCURACY .0002 T.I.R.

.0002 T.I.R. OR LESS AT SPINDLE NOSE, .0005 T.I.R. OR LESS ON TEST ARBOR SIX INCHES FROM SPINDLE NOSE

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost. Same Accuracy Guaranteed!

The B943 Motor Driven Work Head is a compact self-contained power unit for internal and external grinding. It is held in position by two T-slot bolts and can be mounted at any convenient spot on the table. The swivel base, which is graduated 90° one side of center and 45° on the other, permits the Work Head to swivel full 360° if desired. Swivel base can be easily removed from head permitting units to be mounted on table without base if desired. The B943 is easily and quickly mounted on other makes of grinders.

The No. 11 B & S tapered spindle, mounted on ball bearings, is hardened and ground, and is designed to receive chucks, collet fixtures, face plates, straight or tapered sleeves, centers and like equipment. Unit is grease packed at factory and requires no service in the field for the life of the bearings. Streamlined in design, this fixture is quickly mounted and is easy for the operator to keep clean.

The special motor is provided with conveniently located reversing switch which is handy for the operator regardless of the position of the work table or rotation of the work. Motor operates quietly and is fully protected from dust and from any oil entering from working parts.

See this extremely accurate B943 work head at your equipment dealer or write for complete literature.

K. O. LEE COMPANY

ABERDEEN, SOUTH DAKOTA

CIRCLE INFORM-A-GRAM KEY NO. 1811

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Inside Story

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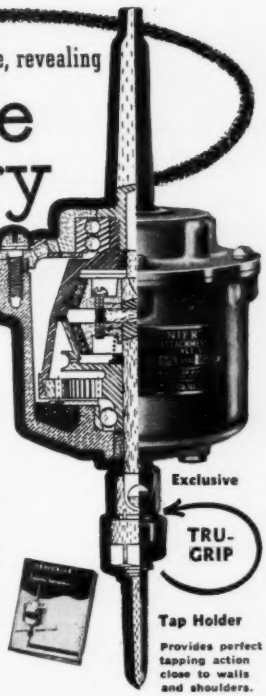

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12-14 S. Clinton St., Dept. 8 Chicago 6, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1812

Horberg PIN GAGES *drill sizes taper entry*

Unlimited time and cost saving advantage in set-up, production, final inspection, wherever holes or slots must be accurately gaged, determined and located.

- Accurate to —.0001" —.0000"
- Concentric taper on lower half .001" smaller than gage size.
- Oil hardened tool steel — standard 1½" length.

PAIRED SETS IN CONVENIENT, INDEXED PLASTIC CASE

Letter sets — 52 gages, A-Z in pairs
Fraction sets — 60 gages, 3/64" to ½" in steps of 1/64" in pairs.
Number sets — 120 gages, 1 to 60 in pairs
Individual gages in stock — extra stands available
All items stocked for immediate delivery

THE *Horberg* GAGE COMPANY

29 STAPLES ST., BRIDGEPORT, CONN.

QUANTITY		
____Letter Sets	@ $ 60.00	
____Fraction Sets	@ $ 66.00	
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____Single gages	@ $ 1.50	
____Case alone	@ $ 15.00	

Please rush checked items and literature to:

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ADDRESS _____
NAME _____
TITLE _____

CIRCLE INFORM-A-GRAM KEY NO. 1813

..THE Precision BENCH TYPE PROTRACTOR

FASTEST METHOD KNOWN FOR CHECKING YOUR SINGLE POINT TOOLS

Will check cutting angles, side and front rakes and clearance angles ALL IN ONE INSTRUMENT. Only 4 moving parts in the complete machine. Surfaces subject to wear are carbide tipped.

Many of the leading and most progressive plants are now using this instrument with great satisfaction.

Write for descriptive literature and ask about our 10 DAY ON-THE-JOB TRIAL.

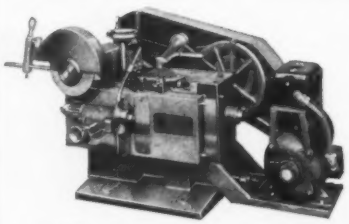
K-P NATIONAL SALES

5280 Grand Haven Road, Muskegon, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1821

AUTOMATIC METAL SAW GRINDER

Cuts Costs .. Makes Money For You!



Wardwell's "35 T" will sharpen up to 115 saws .015 thick at one time . . .

This includes slitting and screw slotting saws and milling cutters. Takes saws from 2" to 5½" diameter. Completely automatic. No attention is required after machine is started. These ingenious, compact and sturdy grinders are saving and making money for their owners all over the world.

WARDWELL

3809 Ridge Road
Cleveland 9, Ohio

You owe it to yourself to write for Bulletin 35 T containing full information.

Maker of Largest Line of Saw and Tool Sharpening Machines

CIRCLE INFORM-A-GRAM KEY NO. 1822

Since 1903

black devil

TWIST DRILLS — REAMERS

Ever since 1903, when Celfor pioneered in the forging and hot-twisting of high speed drills, "Celfor" tools have been specified by the nation's leading steel fabricators for the drilling and reaming of the really rugged jobs in the toughest alloy steels.

CELFOR TOOL COMPANY
DIVISION OF AVILDSEN TOOLS & MACHINES, INC.

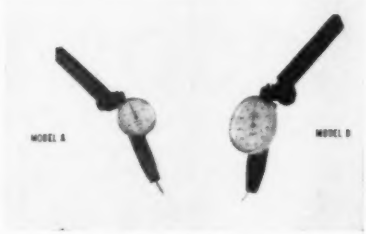
MAKERS OF "REPUBLIC," "CENTURY," "CELFOR" AND "U. S. EAGLE" BRAND TOOLS

NEW YORK PLANT
100 LAFAYETTE ST., NEW YORK 13, N. Y.

3 PLANTS — NEW YORK — CHICAGO — LOS ANGELES

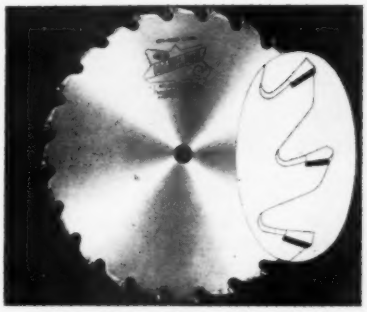
CIRCLE INFORM-A-GRAM KEY NO. 1823

Exceptional Sensitivity and Accuracy are features of these "Puppitast" universal test indicators. The contact points with threaded bases can be screwed into a rotating axis



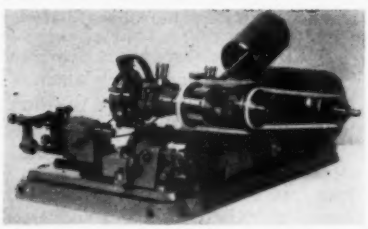
at the tip of the holder. Model A reads in 0.0005" with a total range of 0.030" and Model B, 0.0001" for a range of 0.010". George Scherr Co., Inc., 200 Lafayette St., New York 12, will supply a descriptive circular, or **Circle Inform-A-Gram No. A70.**

A New Line of Carbide Tipped Saws has been introduced by W. F. Meyers Co., Bedford, Ind. The Meyco Mainline Uni-Chip consists of alternating double-beveled and straight raker teeth. The saw comes in several diameters and with different



numbers of teeth designed to produce smooth, fast cuts in non-ferrous metals, plastics and other abrasive materials. A catalog listing prices, diameters and features of the new line is issued by the company, or — **Circle Inform-A-Gram No. A71.**

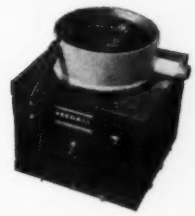
Efficient Sizing of Pivots and similar parts is possible on all ferrous and non-ferrous materials using a Sallaz burnishing machine. Model R-49 which is available with foot pedal or hand lever switch, features



simple, accurate size control and rapid chucking. Maximum workpiece length is approximately 3". Rudolph Koppel Co., Inc., 487 Broadway, New York, or — **Circle Inform-A-Gram No. A72.**

FEED PARTS AUTOMATICALLY

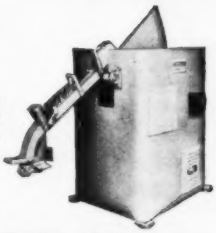
with FEEDALL FEEDERS



VIBRATORY Model for washers and small parts — high rate of feed.

←No. 2200 Elevating Feeder elevates cylindrical or sliding parts for automatic gravity feed.

No. 2000 Blade Feeder feeds parts up to 2" in dia. and 7" long.



Write for Catalog advising purposes for which you require automatic feeders.

FEEDALL INCORPORATED WILLOUGHBY, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1831

Would *you* use a ruler for *precision* measurements?

Pretty silly question. But it's one way of pointing out the solid advantages of JO-LINE Torque Tools over ordinary torque equipment...about like a micrometer as compared with an ordinary ruler. The JO-LINE Torque Wrench gives you:

★ **TORQUE LIMITATION** Here—responsibility for exact torque control rests squarely with the wrench itself—not with various operators.

★ **ACCURATE CALIBRATION** Each JO-LINE Torque Wrench is calibrated to less than 1% error, and is *certified to* within 3% accuracy in writing.

★ **JUST SET YOUR TORQUE** ... cuts out automatically ... no lights, dials, or gauges to read. Lightweight and well-balanced, the JO-LINE is as easy to use as a socket wrench.

★ **CENTER OF TORQUE** Use one hand, two hands, or even a long extension handle...the JO-LINE always provides the same unvarying tension.

★ **RUGGED CONSTRUCTION** JO-LINE Torque Wrenches have been tested through 50,000 cycles. This built-in durability is supplemented by sealing the torque-sensing mechanism so that dirt or liquids cannot affect precision parts.

- *for torque requirements from 10 inch-ounces to 2000 foot-pounds*
- *designed to meet specifications MIL-H-4034A (USAF)*

Write today for your FREE JOMI Catalog with valuable Torque Table Data.

JO LINE TOOLS, INC. 8442 Otis St., Div. 22, South Gate 1, Cal.

CIRCLE INFORM-A-GRAM KEY NO. 1833

IF YOU DO HIGH SPEED MILLING

You'll Need This Helpful NEW Catalog!

ABER CURVED TOOTH MILLING CUTTERS

Cut Straight with a Curve

GIVES ALL THE FACTS ON MILLING WITH CURVED TOOTH CUTTERS

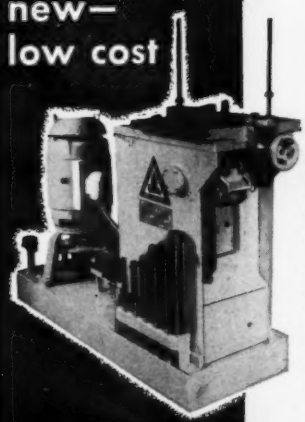
- Complete information on curved tooth milling cutters. How they increase production, save time, extend tool life and eliminate chatter.
- Helps you select the proper cutter for the job. Comprehensive charts and simple ordering data.
- Gives the complete line of Aber Curved Tooth Milling Cutters.
- Contains data sheet on how to sharpen curved tooth milling cutters . . . other helpful information.

Write for FREE Copy Today

ABER ENGINEERING WORKS WATERFORD, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1832

new— low cost



HYDRAULIC KEYSEATER

- fast set-up—saves time and money
- low cost operation—uses standard tool bits
- heavy-duty hydraulic circuit—assures accurate keyways
- compact, 21" x 61"—no special foundation
- versatile—cuts standard, tapered keyways; internal splines

ONLY WITH BLISS' new Hydraulic Keyseater can you get such a size range *from one machine*—¼" to 2" wide, to 12½" long, standard or tapered. It's easily set up for short or long production runs in small, medium or large plants, warehouses, maintenance departments. What's more, no foundation is needed. Speeds range up to 35 spm; heavy-duty hydraulic system is to JIC specs. All adjustments are readily accessible. Seven cutter bars, with standard tool bits, are also available. Special attachments permit internal spline cutting.

Get all the cost-cutting, time-saving facts by writing today for Bulletin 34—

BLISS SINCE 1857

E. W. BLISS COMPANY
1132 North Seventh Street
San Jose, California

CIRCLE INFORM-A-GRAM KEY NO. 1834

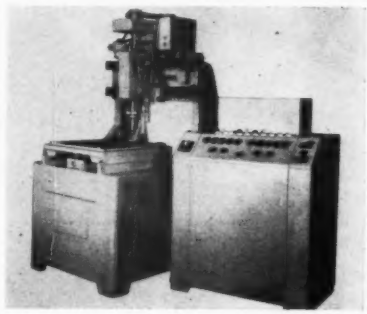
Automate Assembly and Machining Operations with the GEM-17 dial index table. This table will index to ±0.001" on a 13" dia work circle. It steps up output, improves and controls product quality and reduces

rejects. The lock mechanism consists of a locking bolt in Geneva slot cammed both in and out. Gray Equipment Co., 13600 Ford Rd., Dearborn, Mich., or —
Circle Inform-A-Gram No. A73.

Separate Screw Machine Parts from waste chips with the Model E separator. It provides clean separation and accurate control for any size screw machine parts from 1/16" to ¾" dia, and lengths from ¼" to

3½". Parts and chips are fed at a maximum rate of ½ cu ft/min. The separator combines high production automatic feed with the versatility required by jobbing type shops. The McKenzie Engineering Co., Newtown, Conn., or —
Circle Inform-A-Gram No. A74.

Automatically Locate and Drill Holes up to ½" dia with a heavy duty locating and drilling machine. Model LD-24 handles work up to 24" wide and any reasonable length. The drill head will drill up to ½" or



larger holes in templates, panels, printed circuits, castings, etc. Hillyer Instrument Co., Inc., Dept. 97, 54 Lafayette St., New York 13, or —
Circle Inform-A-Gram No. A75.

CAMS

To Your Specifications

• • • • •

— Except Screw Machine Cams —

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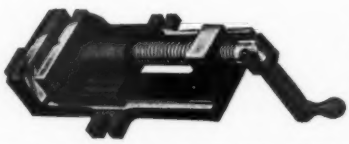
Design Assistance Offered

KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1841

Your Inform-A-Gram Is on Page 90.1



Cut Costs!

with the NEW YOST DRILL PRESS VISE

- **Developed expressly for use on drill press operations.**
- **Does away with special and costly jig fixtures.**
- **Available in two sizes:**

No.	Jaw Width	Max. Opening
1D	3½"	4 "
2D	5 "	5½"

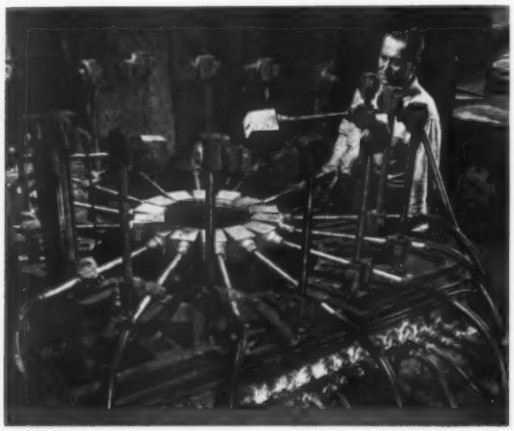
Write today for bulletin on the extensive Yost line.

YOST MFG. CO. 124 Grant St., Cambridge Springs, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 1843

Selective Radiant Gear Hardening

This Lakeside patented machine does a better job, faster on parts such as gears, wheels or sprockets. Spun at controlled speeds, the multiple gas torches cover all surfaces — missing none. This machine plus other units for spinning or progressive flame hardening enables Lakeside to process varieties of machine parts. Give us a call TODAY!



Our Services: Electronic Induction Hardening, Carbonitriding, Flame Hardening, Heat Treating, Bar Stock Treating and Straightening (mill lengths and sizes), Annealing, Stress Relieving, Normalizing, Pack, Gas or Liquid Carburizing, Nitriding, Speed Nitriding, Aerocasing, Chapmanizing, Cyaniding, Sand Blasting. Laboratory Physical Testing.

THE *Lakeside Steel Improvement Co.*

5418 LAKESIDE AVE., CLEVELAND 14, OHIO HENDERSON 1-9100

CIRCLE INFORM-A-GRAM KEY NO. 1842

.0005 HOLE LOCATION IN 3 MINUTES

$10.00 With Case

.200 Dia.

YOU NEED THIS TOOL EVERY TIME YOU USE A DRILL CHUCK or BORING HEAD in a VERTICAL MILL, HORIZONTAL MILL or JIG BORER, if the hole is located from a surface that has been machined.

This toolmaker's wiggler rotates in the machine spindle from 300 to 1200 R.P.M. and is held in a ⅜" collet.

- NO GUESSWORK OR EYE-STRAIN.
- LOCATES FROM FLAT OR ROUND SURFACE.
- LOCATES FROM STEP ONLY .010" HIGH.
- IDEAL TOOL for LOCATING HOLES IN DRILL JIGS, DIES, TOOLS and MACHINE PARTS.
- MADE FROM HARDENED TOOL STEEL WITH ALL SURFACES GROUND.

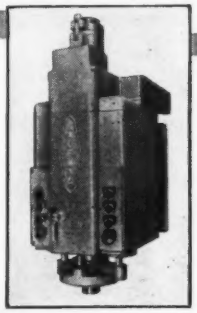
Stocked by dealers in most principal cities.

GLOVER MFG. CO.
422 Park Ave. Meadville, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1844

the all new
VERTICAL or
HORIZONTAL
101 tapper

A brand new . . . Kaufman Tapper with more new operating, control, and production features . . than has ever before been incorporated into a single tapping head. You can mount it vertically or horizontally . . . arrange it in combinations to do two or more operations . . . or mount it horizontal or angular in combination with vertical heads to do various operations simultaneously. Additional revolutionary features include:



- An extremely sensitive torque control . . . which signals overload, stops the machine automatically to avoid tap breakage.
- A pressure lubricated lead screw.
- Positive precision depth control.
- Air operated clutch with instant reversal.
- A simple non-reversing motor drive.
- Spindle speeds ranging from 35 to 785 RPM.

KAUFMAN

These and many additional features are incorporated into the new 101 Series Kaufman Tapper. For more complete information about this and other Kaufman Tappers, write

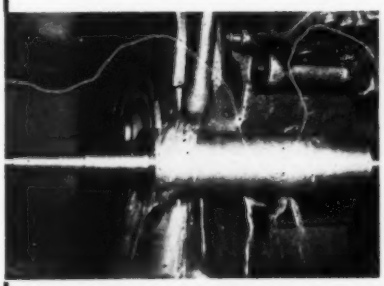
KAUFMAN MFG. CO.

529 S. 29th Street Manitowoc, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 1851

GRIND CLEANER AND FASTER with

"WATER SOLVENT"



No Rusting

No Rancidity

No Foaming

No Clogging

"WATER SOLVENT" is harmless to the skin and eliminates costly shutdowns due to rancidity. Finished parts and machine are entirely free of gummy residue.

"WATER SOLVENT" never requires changing; simply add more water and solvent in the proportion of 200 to 1 as necessary.

ABRASIVE ENGINEERS

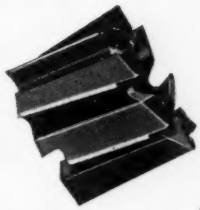
1914 First St., Highland Park, Illinois

IDlewood 2-7213

CIRCLE INFORM-A-GRAM KEY NO. 1852

* CUTTING TOOL COSTS GETTING YOU DOWN?

Systematic "NTS" salvage is the best way to cut cutting tool costs



Stop before you discard a worn or damaged cutter. It may be worth many times its scrap value!

Since 1912 we have been restoring all kinds of cutting tools to new usefulness to help shops control their cutter costs.

Can we assist you in studying your operations and tool usage to determine if a salvage program will save money in your plant? There is no obligation.

Write for this catalog and the salvage story.

NATIONAL NTS TOOL SALVAGE

NATIONAL TOOL SALVAGE CO.

6511 EPWORTH BOULEVARD DETROIT 10 MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1853

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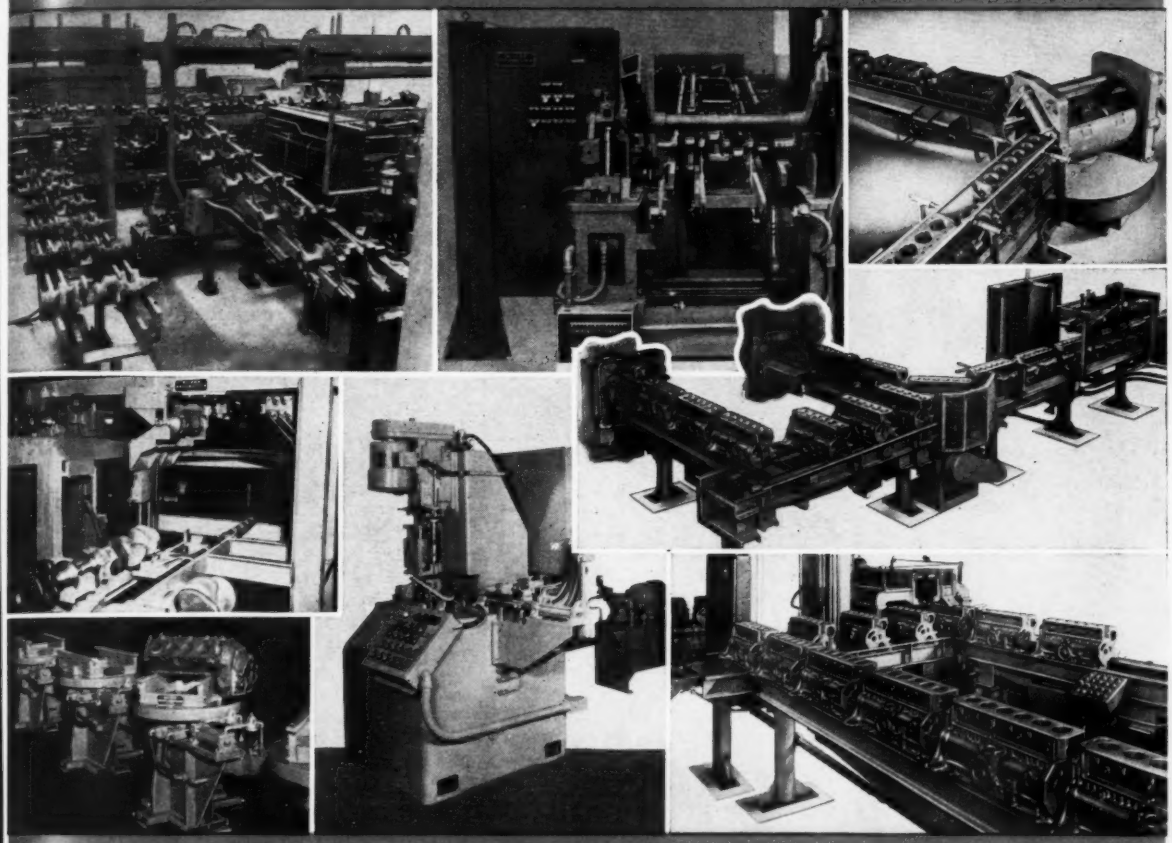

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